MINUTES OF PROCEEDINGS

OF THE

ROYAL SOCIETY OF CANADA

1955

PROCÈS-VERBAUX

DE LA

SOCIÉTÉ ROYALE DU CANADA

1955

OTTAWA
ROYAL SOCIETY OF CANADA

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1955

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TABLE OF CONTENTS

List of Officers of the Society 1
Committees appointed for the year 1955–1956 2
List of Fellows 5
List of Corresponding Members 23
Awards of Chauveau, Flavelle, Henry Marshall Tory, Lorne Pierce, Tyrrell, and Willet G. Miller Medals 23
List of Presidents 24
List of Presidents of Sections 25
Associated Organizations 26

Report of the Honorary Secretary for the year 1954–1955
Council Meetings 27
Minutes of the Seventy-Fourth Annual Meeting 29

Presentation of Medals
Médaille Pierre Chauveau: Jean-Marie Gauvreau 35
Flavelle Medal: Charles Samuel Hanes 35
Henry Marshall Tory Medal: Edgar William Richard Steacie . 36
Lorne Pierce Medal: William Bruce Hutchison 37
Tyrrell Medal: Charles Perry Stacey 38
Willet G. Miller Medal: John Tuzo Wilson 39

Reports of Sections 41

APPENDICES

Appendix A

Presidential Address, "Science and the National Academy," by E. W. R. Steacie 49

Appendix B

Biographical Sketches of Deceased Members
John A. Allan 59
Robert William Boyle 63

Milton Alexander Buchanan 69
Clive Elmore Cairnes 75
John William Campbell 79
Joseph John de Gryse 83
John Alexander Dresser 87
Donald Thomas Fraser 93
Auckland Campbell Geddes 99
René Guénette 105
Skuli Johnson 109
William D. Lighthall 113
Gilbert Norwood 117
Matthew A. Parker 123
Antonio Perrault 127
Bernard Keble Sandwell 133
Donald Young Solandt 137
Robert Meldrum Stewart 141
Robert Charles Wallace 145

APPENDIX C

Titles and Abstracts of Papers presented at the Annual Meeting . 153

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1950—Britnell, G. E., M.A., Ph.D., Head, Department of Economics and Political Science, University of Saskatchewan, Saskatoon, Sask.
1945—Brown, G. W., M.A., Ph.D., LL.D., Professor of History, University of Toronto, and Honorary Editor, University of Toronto Press, Toronto, Ont.
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1930—Lang, R. J., M.A., Ph.D., 146 Douro St., Peterborough, Ont.

1940—McClung, Robert K., M.A., D.Sc., 88 Chestnut St., Winnipeg, Man.

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1935—Williams, W. L. G., M.A., Ph.D., 1635 Selkirk Ave., Montreal, P.Q.
1946—Winkler, C. A., O.B.E., M.Sc., D.Phil., Professor of Chemistry, McGill University, Montreal, P.Q.
1950—Woonton, G. A., M.A., Professor of Physics, Director Eaton Electronics Research Laboratory, McGill University, Montreal, P.Q.
1954—Wright, K. O., M.A., Ph.D., Astrophysicist, Dominion Astrophysical Observatory, Royal Oak, B.C.
1951—Wyman, Max, B.Sc., Ph.D., Associate Professor of Mathematics, University of Alberta, Edmonton, Alta.

Section IV—GEOLOGICAL AND ALLIED SCIENCES

Retired Members

1928—Boyd, W. H., B.A.Sc., 69 Dunvegan Rd., Toronto, Ont.
1923—Cooke, H. C., M.A., Ph.D., 35, Côte St. Antoine, Westmount, Que.
1928—DeLury, J. S., Ph.D., P.O. Box 22, Uxbridge, Ont.
1926—Denis, T. C., D.Sc., 130 Maple Ave., Quebec, P.Q.
1920—Graham, R. P. D., D.Sc., 775 Davaar Ave., Outremont, P.Q.
1928—MacKay, B. R., B.Sc., Ph.D., 193 Carling Ave., Ottawa, Ont.
1926—Malcolm, Wyatt, M.A., 376 Hinton Ave., Ottawa, Ont.
1941—Parsons, A. L., B.A., 360 Fairlawn Ave., Toronto, Ont.

Active Members

1925—Alcock, F. J., Ph.D., Chief Curator, National Museum of Canada, Ottawa, Ont.
1944—Ambrose, J. W., Ph.D., Professor of Geology, Queen's University, Kingston, Ont.
1950—Armstrong, J. E., M.A.Sc., Ph.D., Geologist, Geological Survey of Canada, Vancouver, B.C.
1950—Auger, P. E., B.Sc., Ph.D., Professor of Geology, Laval University, Quebec, P.Q.
1931—Baker, M. B., B.Sc., LL.D., Curator of the Geological Museum, Queen's University, Kingston, Ont.
1920—Bancroft, J. Austen, Ph.D., D.Sc., Consulting Geologist, Anglo American Corporation of South Africa, Johannesburg, South Africa.
1925—Bell, W. A., B.Sc., Ph.D., Geologist, Geological Survey of Canada, Ottawa, Ont.
1951—Berry, L. G., M.A., Ph.D., Associate Professor of Mineralogy, Queen's University, Kingston, Ont.
1940—Bostock, H. S., M.Sc., Ph.D., Senior Geologist, Geological Survey of Canada, Ottawa, Ont.
1951—Brownell, G. M., M.Sc., Ph.D., Professor and Chairman, Department of Geology and Mineralogy, University of Manitoba, Winnipeg, Man.
1955—Byers, A. R., M.Sc., Ph.D., Associate Professor, Department of Geology, University of Saskatchewan, Saskatoon, Sask.
1948—Caley, J. F., M.Sc., M.A., Ph.D., Senior Geologist, Geological Survey of Canada, Ottawa, Ont.
1953—Campbell, Neil, B.Sc., Ph.D., District Geologist, Consolidated Mining and Smelting Company, Trail, B.C.
1918—Camsell, Charles, C.M.G., LL.D., Commissioner, Federal District Commission, Ottawa, Ont.
1933—Clark, T. H., M.A., Ph.D., McGill University, Montreal, P.Q.
1931—Cockfield, W. E., M.Sc., Ph.D., Geologist, Geological Survey of Canada, Vancouver, B.C.
1943—Denis, B. T., B.Sc., Ph.D., Bureau of Mines, Quebec, P.Q.
1946—Derry, D. R., M.A., Ph.D., Executive Vice-President, Rio Canadian Exploration Company, 200 Bay St., Toronto, Ont.
1926—Dolmage, Victor, Ph.D., Consulting Geologist, 1318 Marine Bldg., Vancouver, B.C.

1944—Douglas, G. V., M.C., M.Sc., Carnegie Professor of Geology, Dalhousie University, Halifax, N.S.
1950—Edmunds, F. H., M.Sc., Professor of Geology, University of Saskatchewan, Saskatoon, Sask.
1952—Faessler, Carl, Ph.D., Professor of Mineralogy, Laval University, Quebec, P.Q.
1953—Fortier, Y. O., M.Sc., Ph.D., Geologist, Geological Survey of Canada, Ottawa, Ont.
1950—Fraser, H. J., M.Sc., Ph.D., 44 King St. West, Toronto, Ont.
1955—Frebold, Hans, D.Phil., Head, Section of Stratigraphic Palaeontology, Geological Survey of Canada, Ottawa, Ont.
1942—Fritz, Madeleine A., M.A., Ph.D., Professor of Palaeontology, University of Toronto, Toronto, Ont.
1947—Furnival, G. M., M.A., Ph.D., President, Dominion Oil Limited, Medical Arts Bldg., Calgary, Alta.
1938—Gill, J. E., B.Sc., Ph.D., Professor of Geology, McGill University, Montreal, P.Q.
1935—Gunning, H. C., B.A.Sc., S.M., Ph.D., Dean, Applied Science, Head, Geology and Geography, University of British Columbia, Vancouver, B.C.
1955—Gussow, W. C., M.Sc., Ph.D., Consulting Geologist, Examiner Bldg., Calgary, Alta.
1930—Hanson, George, M.A., Ph.D., Director, Geological Survey of Canada, Ottawa, Ont.
1952—Harrison, J. M., M.A., Ph.D., Geologist, Geological Survey of Canada, Ottawa, Ont.
1934—Hawley, J. E., M.A., Ph.D., Miller Memorial Research Professor and Chairman, Graduate Studies, Department of Geological Sciences, Queen's University, Kingston, Ont.
1947—Henderson, J. F., M.Sc., Ph.D., Geologist, Geological Survey of Canada, Ottawa, Ont.
1929—Hume, G. S., O.B.E., Ph.D., Director General of Scientific Services, Department of Mines & Technical Surveys, Ottawa, Ont.
1940—Hurst, M. E., M.A., Ph.D., Provincial Geologist, Ontario Department of Mines, Toronto, Ont.
1954—James, W. F., M.Sc., Ph.D., D.Sc., Consulting Geologist, Suite 1505, 320 James St., Toronto, Ont.
1919—Johnston, R. A. A., B.A., 112 Old Forest Hill Rd., Toronto 10, Ont.
1943—Jolliffe, A. W., M.A., Ph.D., Queen's University, Kingston, Ont. (Life Member.)
1941—Jones, I. W., B.Sc., Ph.D., Bureau of Mines, Quebec, P.Q.
1948—Kingle, E. D., M.A., Ph.D., Geologist, Geological Survey of Canada, Ottawa, Ont.
1920—Knight, C. W., B.Sc., Consulting Geologist, 1545 Glenburnie Rd., Port Credit, Ont.
1951—Lang, A. H., M.A., Ph.D., Chief, Radioactive Resources Division, Geological Survey of Canada, Ottawa, Ont.
1940—Langford, G. B., B.A.Sc., Ph.D., Head, Department of Geological Sciences, University of Toronto, Toronto, Ont.
1949—Laverdière, l'abbé J. W., L.Sc., D.Sc., Docteur en Droit, Professor of Geology, Laval University, Quebec, P.Q.
1949—Lord, C. S., M.A., Ph.D., Acting Chief Geologist, Geological Survey of Canada, Ottawa, Ont.
1952—MacKenzie, G. S., M.A., Ph.D., University of New Brunswick, Fredericton, N.B.
1933—Mawdsley, J. B., B.Sc., Ph.D., University of Saskatchewan, Saskatoon, Sask.
1947—McGerrigle, H. W., Ph.D., Geologist, Quebec Department of Mines, Quebec, P.Q.
1927—McLearn, F. H., B.E., Ph.D., 817 Ivanhoe Ave., Britannia Heights (Ottawa), Ont.
1924—Moore, E. S., M.A., Ph.D., Department of Geological Sciences, University of Toronto, Toronto, Ont. (Ex-President.)
1937—Norman, G. W. H., B.A.Sc., Ph.D., Geologist, Newmont Mining Corporation, P.O. Box 658, Montrose, Colorado, U.S.A.
1945—Okulitch, V. J., M.A.Sc., Ph.D., Professor and Chairman, Division of Geology, University of British Columbia, Vancouver, B.C.

1925—O'NEILL, J. J., M.Sc., Ph.D., D.Sc., 3246 The Boulevard, Westmount, P.Q. (Ex-President.)
1937—OSBORNE, F. F., M.A.Sc., Ph.D., Professor of Petrology, Laval University, Quebec, P.Q.
1927—POITEVIN, EUGÈNE, B.A.Sc., D.Sc., Chief, Mineralogy Division, Geological Survey of Canada, Ottawa, Ont.
1946—RICE, H. M. A., M.A.Sc., Ph.D., Chief Geological Editor, Geological Survey of Canada, Ottawa, Ont.
1936—RICKABY, H. C., M.A., Deputy Minister of Mines, Parliament Bldgs., Toronto, Ont.
1954—ROBINSON, S. C., M.A.Sc., Ph.D., Geologist, Geological Survey of Canada, Ottawa, Ont.
1954—ROLIFF, W. A., B.Sc., Manager, Eastern Division, Producing Dept., Imperial Oil Ltd., 56 Church St., Toronto, Ont.
1927—ROSE, BRUCE, B.Sc., Ph.D., Queen's University, Kingston, Ont.
1936—RUSSELL, L. S., M.A., Ph.D., Chief Zoologist, National Museum of Canada, Ottawa, Ont.
1954—SATTERLY, JACK, M.A., Ph.D., Geologist, Ontario Department of Mines, Toronto, Ont.
1938—SLIPPER, S. E., B.Sc., 2013-8th St. S.W., Calgary, Alta.
1955—SPROULE, J. C., M.A., Ph.D., J. C. Sproule and Associates, Geological Consultants, 901-8th Ave. West, Calgary, Alta.
1949—STERNBERG, C. M., 169 Holmwood Ave., Ottawa, Ont.
1949—STEVENSON, J. S., B.A.Sc., Ph.D., Associate Professor of Mineralogy, McGill University, Montreal, P.Q.
1936—STOCKWELL, C. H., B.A.Sc., Ph.D., Senior Geologist, Geological Survey of Canada Ottawa, Ont.
1939—SWANSON, C. O., M.A.Sc., Ph.D., Chief Geologist, Consolidated Mining & Smelting Co., Ltd., Trail, B.C.
1927—TANTON, T. L., M.A., Ph.D., Consulting Geologist, 9 Grosvenor Ave., Ottawa, Ont.
1945—THOMSON, J. E., M.A., Ph.D., Assistant Provincial Geologist, Department of Mines, Toronto, Ont.
1910—TYRRELL, J. B., M.A., B.Sc., LL.D., 14 Walmer Rd., Toronto, Ont. (Life Member.)
1937—WALKER, J. F., B.A.Sc., Ph.D., Deputy Minister of Mines, Province of British Columbia, Victoria, B.C.
1945—WARREN, H. V., B.Sc., D.Phil., Professor, Department of Geology and Geography, University of British Columbia, Vancouver, B.C.
1931—WARREN, P. S., Ph.D., A.R.C.S., Head of Department and Professor of Geology, University of Alberta, Edmonton, Alta.
1953—WATSON, J. W., M.A., Ph.D., Professor of Geography, Edinburgh University, Edinburgh, Scotland.
1953—WEEKS, L. J., B.Sc., M.A., Ph.D., Geologist, Geological Survey of Canada, Ottawa, Ont.
1939—WICKENDEN, R. T. D., Ph.B., M.A., Ph.D., 406 Customs Bldg., Calgary, Alta.
1926—WILLIAMS, M. Y., B.Sc., Ph.D., Professor Emeritus of Geology, University of British Columbia, Vancouver, B.C.
1938—WILSON, ALICE E., M.B.E., Ph.D., 328 McLeod St., Ottawa, Ont.
1948—WILSON, J. TUZO, O.B.E., Legion of Merit (USA) M.A., Ph.D., Professor of Geophysics, University of Toronto, Toronto, Ont.
1924—WILSON, M. E., Ph.D., 22 Monkland Ave., Ottawa, Ont.
1932—WRIGHT, J. F., Ph.D., Geologist, Geological Survey of Canada, Ottawa, Ont.
1932—WRIGHT, W. J., M.A., Ph.D., LL.D., 117 Church St., Fredericton, N.B.

Section V.—BIOLOGICAL SCIENCES

Retired Members

1919—Cameron, John, M.D., D.Sc.
1946—Craigie, James, O.B.E., M.B., Ph.D., D.P.H., F.R.S., Imperial Cancer Research Fund, Burtonhole Lane, The Ridgeway, Mill Hill, N.W. 7, London, England.
1921—Faull, J. H., Ph.D., 72 Fresh Pond Lane, Cambridge 38, Mass., U.S.A.
1922—Gibson, Arthur, LL.D., 183 King St. E., Brockville, Ont.
1931—Gussow, H. T., LL.D., F.R.M.S., Hon. F.R.H.S., 2605 Killarney Rd., Victoria, B.C.
1916—Hunter, Andrew, C.B.E., M.A., B.Sc., M.B., Ch.B., F.R.S.E., 2 Sultan St., Toronto, Ont.
1943—Kirk, L. E., M.S.A., Ph.D., Agricultural Organization of U.N., Rome, Italy.
1911—Leathes, J. B., B.Ch., Sheffield, England.
1909—MacBride, Ernest W., M.A., F.R.S., London, England.
1932—Macallum, A. B., M.B., M.D., Ph.D., University of Western Ontario, London, Ont.
1937—Marrian, G. F., D.Sc., F.R.I.C., F.R.S., Department of Medical Chemistry, University of Edinburgh, Edinburgh, Scotland.
1937—McDunnough, J. H., M.A., Ph.D., Nova Scotia Museum of Science, Halifax, N.S.
1922—Miller, James, M.D., D.S.C., F.R.C.P.E., F.R.C.P.(C), Painswick House, near Stroug, Gloucestershire, England.
1922—Miller, F. R., M.A., M.B., M.D., F.R.C.P.(C), F.R.S., 74 St. George St., Toronto, Ont.
1930—Newton, Robert, M.C., B.S.A., M.Sc., Ph.D., 1972 Robson St., Vancouver 8, B.C.
1922—O'Donoghue, C. H., D.Sc., F.R.S.E., University of Reading, Reading, England.
1928—Swaine, J. M., C.B.E., B.S.A., M.Sc., Ph.D., 484 Brierwood Ave., Ottawa, Ont.
1915—Walker, E. M., M.B., 120 Cheltenham Ave., Toronto, Ont.
1932—Whitnall, S. E., M.A., M.D., B.Ch., M.R.C.S.

Active Members

1944—Anderson, J. A., M.Sc., Ph.D., Chief Chemist, Board of Grain Commissioners for Canada, Winnipeg, Man.
1939—Anderson, R. M., B.Ph., Ph.D., 58, The Driveway, Ottawa, Ont.
1937—Bailey, D. L., M.S., Ph.D., University of Toronto, Toronto, Ont.
1952—Bannan, M. W., Ph.D., Associate Professor of Botany, University of Toronto, Toronto, Ont.
1936—Berrill, N. J., Ph.D., D.Sc., F.R.S., Strathcona Professor of Zoology, McGill University, Montreal, P.Q.
1931—Best, C. H., C.B.E., M.A., M.D., D.Sc., LL.D., F.R.S., Professor and Head of Department of Physiology and Director of Banting & Best Department of Medical Research, Charles H. Best Institute, University of Toronto, Toronto, Ont.
1924—Boyd, William, M.D., LL.D., D.Sc., Lecturer on History of Medicine, University of Toronto, Toronto, Ont.
1936—Brittain, W. H., B.S.A., M.S., Ph.D., D.Sc., Dean, Faculty of Agriculture of McGill University, and Vice-Principal of Macdonald College, P.Q.
1939—Browne, J. S. L., B.Sc., M.D., C.M., Ph.D., LL.D., Director, McGill University Clinic, Royal Victoria Hospital, Montreal, P.Q.
1952—Burton, A. C., M.B.E., B.Sc., M.A., Ph.D., Professor of Biophysics, University of Western Ontario, London, Ont.
1939—Cameron, T. W. M., M.A., Ph.D., D.Sc., M.R.C.V.S., Professor and Chairman, Department of Parasitology, McGill University, Director, Institute of Parasitology, Macdonald College, P.Q.
1933—Campbell, W. R., M.A., M.D., Medical Arts Bldg., Toronto, Ont.

1955—Cantero, Antonio, M.D., C.M., Director of Research Notre Dame Hospital, Montreal Cancer Institute, Montreal, P.Q.

1954—Cipriani, A. J., B.Sc., M.D., C.M., Director, Biology Division, Atomic Energy of Canada, Ltd., Chalk River, Ont.

1925—Clemens, W. A., M.A., Ph.D., Director, Institutes of Oceanography and Fisheries, University of British Columbia, Vancouver, B.C.

1954—Collier, H. B., M.A., Ph.D., Professor and Head, Department of Biochemistry, University of Alberta, Edmonton, Alta.

1925—Collip, J. B., C.B.E., Ph.D., M.D., D.Sc., LL.D., F.R.S., Dean of Medicine, University of Western Ontario, London, Ont.

1944—Cone, W. V., B.S., M.D., Professor of Neurosurgery, McGill University, Neurosurgeon-in-Chief, Royal Victoria Hospital and Montreal Neurological Institute, Montreal, P.Q.

1943—Cook, W. H., O.B.E., M.Sc., Ph.D., LL.D., Director, Division of Applied Biology, National Research Council, Ottawa, Ont.

1946—Cowan, Ian McT., Ph.D., Head, Department of Zoology, University of British Columbia, Vancouver, B.C.

1935—Craigie, E. Horne, Ph.D., Professor of Comparative Anatomy and Neurology, Department of Zoology, University of Toronto, Toronto, Ont.

1936—Craigie, J. H., M.S., Ph.D., D.Sc., LL.D., F.R.S., Principal Plant Pathologist, Science Service, Department of Agriculture, Ottawa, Ont.

1945—Crampton, E. W., M.Sc., Ph.D., Professor and Chairman, Department of Nutrition, Professor of Animal Husbandry, Macdonald College, P.Q.

1949—Dansereau, Pierre, B.Sc.Agr., D.Sc., Institut Botanique de l'Université de Montréal, Montréal (P.Q.)

1953—Dauphinee, J. A., O.B.E., M.A., Ph.D., M.D., Professor of Pathological Chemistry and Head of the Department, University of Toronto, Toronto, Ont.

1952—Daviault, Lionel, L.Sc.A., M.Sc., D.Sc., Officer in Charge, Laboratory of Forest Zoology, Science Service, Canadian Department of Agriculture, Quebec, P.Q.

1947—Dolman, C. E., M.B., B.S., D.P.H., Ph.D., Professor and Head, Department of Bacteriology & Immunology, University of British Columbia, Vancouver, B.C.

1938—Drayton, F. L., B.S.A., Ph.D., Associate Chief, Botany and Plant Pathology Division, Science Service, Department of Agriculture, Ottawa, Ont.

1947—Duff, G. Lyman, M.A., M.D., Ph.D., Strathcona Professor of Pathology and Dean of the Faculty of Medicine, McGill University, Montreal, P.Q.

1951—Dugal, L.-Paul, O.B.E., M.A., Ph.D., Director of Research, Institute of Physiology, Director of Experimental Physiology, Faculty of Medicine, Laval University, Quebec, P.Q.

1954—Dunbar, M. J., M.A., Ph.D., Associate Professor of Zoology, McGill University, Montreal, P.Q.

1938—Dymond, J. R., O.B.E., M.A., D.Sc., Head, Department of Zoology, University of Toronto, Toronto, Ont.

1952—Eagles, Blythe, M.A., Ph.D., Dean, Faculty of Agriculture, and Head, Department of Dairying, University of British Columbia, Vancouver, B.C.

1941—Ettinger, G. H., M.B.E., M.D., C.M., Dean, Faculty of Medicine, Queen's Univeristy, Kingston, Ont.

1948—Ferguson, J. K. W., M.B.E., M.A., M.D., Professor and Head, Department of Pharmacology, University of Toronto, Toronto, Ont.

1949—Fisher, K. C., M.A., Ph.D., Associate Professor, Animal Physiology; Chairman, Div. 2 (Science), School of Graduate Studies, University of Toronto, Toronto, Ont.

1939—Foerster, R. E., M.A., Ph.D., Principal Scientist, Fisheries Research Board of Canada, Pacific Biological Station, Nanaimo, B.C.

1949—Frappier, Armand, O.B.E., M.D., L.ès Sc., Officier d'Académie (avec palmes), Professor and Director, Department of Bacteriology, University of Montreal, Montreal, P.Q.

1948—Fry, F. E. J., M.B.E., M.A., Ph.D., Associate Professor of Limnology, Department of Zoology, University of Toronto, Toronto, Ont.

1952—Gibbard, James, B.S.A., S.M., Director, Laboratory of Hygiene, Department of National Health & Welfare, Ottawa, Ont.

1939—Gibbs, R. D., M.Sc., Ph.D., Associate Professor of Botany, McGill University, Montreal, P.Q.

1955—Gibbons, N. E., M.A., Ph.D., Head, Food Microbiology Section, Division of Applied Biology, National Research Council, Ottawa, Ont.

1941—Goulden, C. H., M.S.A., Ph.D., LL.D., Chief, Cereal Crops Division, Department of Agriculture, Ottawa, Ont.

1948—Grace, N. H., M.B.E., M.A., Ph.D., Director, Research Council of Alberta, Edmonton, Alta.

1938—Graham, D. A., C.B.E., M.B., F.R.C.P.(London), 343 Lytton Blvd., Toronto, Ont.

1951—Groves, J. W., M.A., Ph.D., Head, Mycology Unit, Science Service, Department of Agriculture, Ottawa, Ont.

1944—Hall, G. E., M.S.A., M.D., Ph.D., D.ès Sc., LL.D., President and Vice-Chancellor, University of Western Ontario, London, Ont.

1951—Ham, A. W., M.B., Professor of Anatomy, Department of Anatomy, University of Toronto, Toronto, Ont.

1944—Hanna, W. F., C.B.E., M.Sc., Ph.D., LL.D., Chief, Botany and Plant Pathology Division, Department of Agriculture, Ottawa, Ont.

1943—Hart, J. L., M.A., Ph.D., Director, Atlantic Biological Station, Fisheries Research Board of Canada, St. Andrews, N.B.

1947—Hayes, F. R., M.Sc., Ph.D., D.Sc., G. S. Campbell Professor of Biology and Head of the Department, Dalhousie University, Halifax, N.S.

1949—Heard, R. D. H., M.A., Ph.D., McGill University, Montreal, P.Q.

1953—Heimburger, C. C., M.Sc.F., Ph.D., Biologist in charge of forest tree breeding, Ontario Department of Lands and Forests, Maple, Ont.

1955—Hoar, W. S., M.A., Ph.D., Professor of Zoology and Fisheries, University of British Columbia, Vancouver, B.C.

1951—Hopkins, J. W., National Research Council, Ottawa, Ont.

1947—Huntsman, A. G., M.B., M.D., 217 Indian Rd., Toronto, Ont.

1933—Hutchinson, A. H., M.A., Ph.D., Emeritus Professor and Special Lecturer, Department of Biology & Botany, University of British Columbia, Vancouver, B.C.

1952—Jaques, L. B., M.A., Ph.D., Professor and Head, Department of Physiology, University of Saskatchewan, Saskatoon, Sask.

1950—Johnson, T., B.S.A., M.Sc., Ph.D., Officer in Charge, Plant Pathology Laboratory, Science Service, Canada Agriculture, Winnipeg, Man.

1950—Krotkov, G., M.A., Ph.D., Professor of Biology, Queen's University, Kingston, Ont.

1945—Labarre, Jules, B.Ph., L.ès S., D.ès S., University of Montreal, Montreal, P.Q.

1946—Larmour, R. K., M.Sc., Ph.D., Director of Research, Maple Leaf Milling Co., Limited, Toronto 9, Ont.

1945—Leach, W., M.Sc., Ph.D., D.Sc., Dencross Terrace, Saanichton, B.C.

1951—Leblond, C. P., M.D., L.ès Sc., Ph.D., D.Sc., Professor of Anatomy, McGill University, Montreal, P.Q.

1949—Ledingham, G. A., M.B.E., M.Sc., Ph.D., Director, Prairie Regional Laboratory, Saskatoon, Sask.

1940—Lochhead, A. G., M.Sc., Ph.D., Chief, Bacteriology Division, Science Service, Department of Agriculture, Ottawa, Ont.

1924—Macklin, C. C., M.B., M.D., M.A., Ph.D., D.Sc., Department of Anatomy, University of Toronto, Toronto, Ont.

1944—MAHEUX, GEORGES, M.A., I.F., M.Sc.Ag., D.Sc., Professeur, Faculté de Génie forestier, Université Laval, Québec (P.Q.)

1941—MAINLAND, D., M.B., Ch.B., D.Sc., F.R.S.E., Professor of Medical Statistics and Chairman of Department, New York University College of Medicine, New York, N.Y.

1931—MASSON, C. L. P., L.ès Sc., M.D., Docteur Honoris Causa de l'Université de Montréal et de l'Université McGill, Directeur du département d'Anatomie pathologique, Université de Montréal, Montréal (P.Q.)

1953—MCCALLA, A. G., M.Sc., Ph.D., Dean, Faculty of Agriculture, University of Alberta, Edmonton, Alta.

1942—MCFARLANE, W. D., M.A., B.Sc.(Agr.), Ph.D., Director of Research, Canadian Breweries Limited, Research Division, 307 Fleet St. E., Toronto, Ont.

1942—MCHENRY, E. W., M.A., Ph.D., Professor of Public Health Nutrition, University of Toronto, Toronto, Ont.

1926—MEAKINS, J. C., C.B.E., M.D., C.M., M.D., LL.D., F.A.C.P., F.R.C.P.(C), F.R.S.E., Royal Victoria Hospital, Montreal, P.Q.

1945—MITCHELL, C. A., B.V.Sc., D.V.M., Chief, Division of Animal Pathology, Department of Agriculture, Animal Diseases Research Institute, Hull, P.Q.

1936—MOLONEY, P. J., O.B.E., M.A., Ph.D., Connaught Laboratories, University of Toronto, Toronto, Ont.

1938—MOORHOUSE, V. H. K., M.C., B.A., M.B., M.D., Box 569, Orangeville, Ont.

1950—MORIN, J. E., M.D., M.C.R.M.(C), C.M.C.P.Q., Professeur de bactériologie, directeur des laboratoires, Université Laval, Québec (P.Q.)

1947—MORRELL, C. A., M.A., Ph.D., Director, Food and Drug Divisions, Department of National Health and Welfare, Ottawa, Ont.

1938—MOSS, E. H., M.A., Ph.D., Professor of Botany and Head of the Department, University of Alberta, Edmonton, Alta.

1938—MURRAY, E. G. D., O.B.E., M.A., L.M.S.S.A., M.D., D.Sc., Professor of Bacteriology & Immunology, and Chairman of the Department, McGill University, Montreal, P.Q.

1947—NEATBY, K. W., M.S.A., Ph.D., LL.D., Director, Science Service, Department of Agriculture, Ottawa, Ont.

1954—NEAVE, FERRIS, M.Sc., Ph.D., Principal scientist, Fisheries Research Board of Canada, Pacific Biological Station, Nanaimo, B.C.

1945—NEEDLER, A. W. H., O.B.E., M.A., Ph.D., D.Sc., Director, Pacific Biological Station, Nanaimo, B.C.

1942—NEWTON, MARGARET, B.S.A., M.Sc., Ph.D., 2392 Beach Dr., Victoria, B.C.

1950—NOBLE, R. L., M.D., Ph.D., D.Sc., Professor and Associate Director, Collip Medical Research Laboratory, University of Western Ontario, London, Ont.

1953—ORR, J. H., M.D., C.M., F.R.C.P.(C), Queen's University, Kingston, Ont.

1955—PAGÉ, E., M.B.E., B.S.A., Ph.D., Directeur de l'Institut de Biologie, Université de Montréal, Case postale 6128, Montréal (P.Q.)

1935—PENFIELD, WILDER G., O.M., C.M.G., Litt.B., M.D., M.A., B.Sc., D.Sc., F.R.S., Montreal Neurological Institute, Montreal, Que.

1948—POMERLEAU, RENÉ, B.S.A., M.Sc., D.Sc., Chef de laboratoire, Lab. de biologie forestière, Section pathologie, Université Laval, Québec (P.Q.)

1946—PORSILD, A. E., M.B.E., B.A., Ph.D., Chief Botanist and Keeper of the National Herbarium of Canada, National Museum, Ottawa, Ont.

1942—PRÉFONTAINE, GEORGES, M.D., Lic.Sc., Docteur honoris causa de l'Université d'Alger, Directeur des laboratoires, Hôpital Sanatorium Saint-Joseph, Montréal (P.Q.)

1953—QUASTEL, J. H., A.R.C.S., B.Sc., Ph.D., D.Sc., F.R.S., Professor of Biochemistry, McGill University, and Director, Research Institute, Montreal General Hospital, Montreal, P.Q.

1944—Rawson, Donald S., M.A., Ph.D., Professor and Head, Department of Biology, University of Saskatchewan, Saskatoon, Sask.

1954—Raymond, Marcel, L.Sc., Botaniste, taxonomiste, Jardin Botanique de Montréal, Montréal (P.Q.)

1954—Rossiter, R. J., B.Sc., M.A., D.Phil., B.M.B.Ch., D.M., Professor and Head, Department of Biochemistry, University of Western Ontario, London, Ont.

1942—Rousseau, Jacques, B.A., L.Sc., D.Sc., Ph.D., Directeur, Jardin botanique de Montréal, Montréal (P.Q.)

1934—Rowan, William, D.Sc., F.Z.S., University of Alberta, Edmonton, Alta.

1939—Scott, D. A., M.A., Ph.D., F.R.S., Research member, Connaught Medical Research Laboratories, University of Toronto, Toronto 5, Ont.

1941—Selye, Hans, M.D., Ph.D., D.Sc., Professor and Director of the Institute of Experimental Medicine and Surgery, University of Montreal, Montreal, P.Q.

1955—Senn, H. A., M.A., Ph.D., Head, Botany Unit, Botany & Plant Pathology Division, Science Service, Dept. of Agriculture, Ottawa, Ont.

1946—Shaner, R. F., Ph.B., Ph.D., Professor of Anatomy, University of Alberta, Edmonton, Alta.

1935—Sifton, H. B., M.A., Ph.D., Head, Department of Botany, University of Toronto, Toronto, Ont.

1940—Simard, L. C., M.D., F.R.C.P.(C), University of Montreal, Montreal, P.Q.

1948—Solandt, O. M., O.B.E., B.Sc., M.A., M.D., M.R.C.P., LL.D., Chairman, Defence Research Board, Ottawa, Ont.

1951—Speakman, H. B., B.Sc., M.Sc., D.Sc., LL.D., Director, Ontario Research Foundation, Toronto, Ont.

1953—Strickland, E. H., M.Sc., D.Sc., 2945 Tudor Rd., Victoria, B.C.

1934—Taylor, N. B., M.D., M.R.C.S., F.R.C.S., 21 Ardwold Gate, Toronto, Ont.

1950—Templeman, W., O.B.E., B.Sc., M.A., Ph.D., Director, Newfoundland Fisheries Research Station, St. John's, Newfoundland.

1947—Thompson, I. M., B.Sc., M.B., Ch.B., F.R.S.E., Professor of Anatomy and Chairman of the Department, University of Manitoba, Winnipeg, Man.

1921—Thompson, W. P., M.A., Ph.D., D.Sc., President, University of Saskatchewan, Saskatoon, Sask. (Ex-President.)

1949—Thompson, W. R., B.S.A., D.Sc., Ph.D., F.R.S., Commonwealth Bureau of Biological Control, Ottawa, Ont.

1936—Thomson, D. L., M.A., B.Sc., Ph.D., LL.D., Gilman Cheney Professor of Biochemistry and Dean of the Faculty of Graduate Studies, McGill University, Montreal, P.Q.

1950—Tremblay, J.-L., B.Sc., D.Sc., Professor of Marine Biology, Laval University, Quebec, P.Q.

1955—Venning, Eleanor H., M.Sc., Ph.D., Associate Professor of Experimental Medicine, McGill University, Montreal, P.Q.

1934—Wardle, R. A., M.Sc., University of Manitoba, Winnipeg, Man.

1930—Wasteneys, H., Ph.D., Professor Emeritus of Biochemistry, University of Toronto, Toronto, Ont.

1943—Wynne, A. M., M.A., Ph.D., University of Toronto, Toronto, Ont.

1940—Wynne-Edwards, V. C., M.A., Marsichall College, University of Aberdeen, Aberdeen, Scotland.

1935—Young, E. Gordon, M.Sc., Ph.D., Director of the Maritime Regional Laboratory, National Research Council Laboratories, Halifax, N.S.

CORRESPONDING MEMBERS

SECTION I

De Lacretelle, Jacques, de l'Académie française, Paris.

SECTION II

Siebert, Wilbur H., M.A., 182 West Tenth Ave., Columbus, Ohio, U.S.A.

SECTION IV

Watts, W. W., Imperial College of Science and Technology, London, England.

SECTION V

Hanes, C. S., Ph.D., Sc.D., F.R.S., 58 Kendal Ave., Toronto, Ont.

MEDAL AWARDS

MEDAILLE PIERRE CHAUVEAU

(Founded 1952)

1952—Pierre Daviault
1953—B. K. Sandwell, LL.D., D.C.L.
1954—Gérard Morisset, B.A., LL.L.
1955—Jean-Marie Gauvreau, D.Sc.Pol.

FLAVELLE MEDAL

(Founded 1925)

1945—R. B. Thomson, B.A.
1946—William Rowan, D.Sc., F.Z.S.
1947—G. B. Reed, O.B.E., M.A., B.Sc., Ph.D., LL.D.
1948—Margaret Newton, B.S.A., M.Sc., Ph.D.
1949—W. P. Thompson, M.A., Ph.D., D.Sc.
1950—C. H. Best, C.B.E., M.A., M.D., D.Sc., F.R.C.P.(C), F.R.S., Hon. D.Sc.(Oxon.)
1951—Wilder G. Penfield, C.M.G., Litt.B., M.D., M.A., B.Sc., D.Sc., F.R.S.
1952—A. G. Huntsman, M.D.
1953—E. G. D. Murray, O.B.E., M.A., L.M.S.S.A.
1954—D. A. Scott, M.A., Ph.D., F.R.S.
1955—C. S. Hanes, Ph.D., Sc.D., F.R.S.

HENRY MARSHALL TORY MEDAL

(Founded 1943)

1943—John L. Synge, M.A., Sc.D., F.R.S.
1944—Frank Allen, M.A., Ph.D., LL.D.
1945—Otto Maass, C.B.E., M.Sc., Ph.D., LL.D., F.R.S.
1946—John S. Foster, B.Sc., Ph.D., F.R.S.
1947—E. F. Burton, O.B.E., Ph.D.
1949—H. S. M. Coxeter, Ph.D., F.R.S.
1951—T. Thorvaldson, A.M., Ph.D.
1953—G. Herzberg, M.A., Dipl.Ing., Dr.Ing., F.R.S.
1955—E. W. R. Steacie, O.B.E., M.Sc., Ph.D., D.Sc., LL.D., F.R.S.

LORNE PIERCE MEDAL

(Founded 1926)

1945—L'abbé Félix-Antoine Savard
1946—Charles N. Cochrane, M.A. (posthumously)
1947—Dorothy Livesay (Mrs. Duncan Macnair)
1948—Gabrielle Roy (Mme Carbotte)
1949—John Murray Gibbon, B.A., D. ès L.
1950—Marius Barbeau, LL.L., B.Sc., D. ès L., Dipl.Anth.
1951—E. K. Brown, B.A., D. ès L. (posthumously)
1952—Hugh MacLennan, M.A., Ph.D.
1953—Earle Birney, Ph.D.
1954—Alain Grandbois
1955—William Bruce Hutchison

TYRRELL MEDAL

(Founded 1928)

1945—Fred Landon, M.A. LL.D., D.Litt.
1946—A. L. Burt, M.A.
1947—A. R. M. Lower, Ph.D., LL.D.
1948—Le chanoine Lionel Groulx, Ph.D., D.Th., D. ès L.
1949—Reginald G. Trotter, M.A., Ph.D., D.C.L.
1950—John Bartlet Brebner, M.A., B. Litt., Ph.D., Litt.D.
1951—Jean Bruchési, LL.L., D.Sc.Pol., D. ès L., and
D. G. Creighton, M.A., LL.D.
1952—C. B. Sissons, LL.D.
1953—Séraphin Marion, M.A., D. ès L.
1954—G. de T. Glazebrook
1955—C. P. Stacey, O.B.E., A.M., Ph.D.

WILLET G. MILLER MEDAL

(Founded 1943)

1943—Norman Levi Bowen, M.A., Ph.D., Sc.D.
1945—Morley E. Wilson, Ph.D.
1947—F. H. McLearn, B.E., Ph.D.
1949—H. V. Ellsworth, M.A., Ph.D.
1951—J. E. Hawley, M.A., Ph.D.
1953—C. H. Stockwell, B.A.Sc., Ph.D.
1955—J. Tuzo Wilson, O.B.E., Legion of Merit (U.S.A.), M.A., Ph.D.

LIST OF PRESIDENTS

1945-1946 . . . E. S. Moore, M.A., Ph.D.
1946-1947 . . . Harold A. Innis, M.A., Ph.D.
1947-1948 . . . W. P. Thompson, M.A., Ph.D., D.Sc.
1948-1949 . . . Gustave Lanctôt, D.ès L., LL.M., LL.D., D.Sc.Pol., C.R.
1949-1950 . . . Joseph A. Pearce, M.A., Ph.D.
1950-1951 . . . J. J. O'Neill, M.Sc., Ph.D.
1951-1952 . . . H. F. Angus, M.A., B.C.L., LL.D
1952-1953 . . . G. B. Reed, O.B.E., M.A., B.Sc., Ph.D., LL.D.
1953-1954 . . . Jean Bruchési, LL.L., D.Sc.Pol., D. ès L.
1954-1955 . . . E. W. R. Steacie, O.B.E., Ph.D., D.Sc., F.R.S.
1955-1956 . . . G. S. Hume, O.B.E., Ph.D.

LIST OF PRESIDENTS OF SECTIONS

SECTION I

1945-1946	Séraphin Marion
1946-1947	Pierre Daviault
1947-1948	Arthur Saint-Pierre
1948-1949	Léopold Houlé
1949-1950	Le chanoine Georges Robitaille
1950-1951	Donatien Frémont
1951-1952	L'abbé Arthur Maheux
1952-1953	Claude Melançon
1953-1954	Gérard Morisset
1954-1955	Jean Chauvin
1955-1956	Eugène L'Heureux

SECTION II

1945-1946	D. C. Harvey
1946-1947	Alexander Brady
1947-1948	R. K. Gordon
1948-1949	B. K. Sandwell
1949-1950	A. G. Dorland
1950-1951	W. A. Mackintosh
1951-1952	A. S. P. Woodhouse
1952-1953	A. R. M. Lower
1953-1954	F. M. Salter
1954-1955	D. A. MacGibbon
1955-1956	J. S. Thomson

SECTION III

1945-1946	C. T. Sullivan
1946-1947	E. L. Harrington
1947-1948	E. W. R. Steacie
1948-1949	J. S. Foster
1949-1950	C. S. Beals
1950-1951	H. G. Thode
1951-1952	Gerhard Herzberg
1952-1953	R. L. Jeffery
1953-1954	P. E. Gagnon
1954-1955	R. M. Petrie
1955-1956	W. H. Watson

SECTION IV

1945-1946	B. R. MacKay
1946-1947	Bruce Rose
1947-1948	F. J. Alcock
1948-1949	Victor Dolmage
1949-1950	T. L. Tanton
1950-1951	P. S. Warren
1951-1952	G. S. Hume
1952-1953	G. Hanson
1953-1954	T. H. Clark
1954-1955	J. B. Mawdsley
1955-1956	J. E. Hawley

SECTION V

1945-1946	B. P. Babkin
1946-1947	J. R. Dymond
1947-1948	E. Gordon Young
1948-1949	A. H. Hutchinson
1949-1950	T. W. M. Cameron
1950-1951	L. C. Simard
1951-1952	C. L. Huskins
1952-1953	W. A. Clemens
1953-1954	R. D. Gibbs
1954-1955	E. G. D. Murray
1955-1956	Georges Maheux

ASSOCIATED ORGANIZATIONS

The Canadian Institute of Mining and Metallurgy

THE ROYAL SOCIETY OF CANADA

REPORT OF THE HONORARY SECRETARY FOR THE YEAR 1954–1955

COUNCIL MEETINGS

The Council met three times during the year to conduct the affairs of the Society. The Report of Council presented to the seventy-fourth annual meeting of the Royal Society of Canada contains a complete account of the year's business.

The Sections recommended the election of twenty-four Fellows. Their names, and the Sections to which they were elected, appear under "Annual Meeting."

Six medals were awarded by the Society:

Médaille Pierre Chauveau to Jean-Marie Gauvreau
Flavelle Medal to Dr. Charles S. Hanes
Henry Marshall Tory Medal to Dr. E. W. R. Steacie
Lorne Pierce Medal to Mr. Bruce Hutchison
Tyrrell Medal to Colonel C. P. Stacey
Willet G. Miller Medal to Dr. J. Tuzo Wilson
(Citations are given on pages 35–40).

On the recommendation of the Scholarships Board, pre-doctoral scholarships were awarded to the following three scholars:

Douglas G. Anglin, of Winnipeg, for studies at Oxford to complete the D.Phil. on International Relations.
Ronald J. Baker, of Vancouver, to study general linguistics at the University of London School of Oriental and African Studies.
M. Clement Perron, of Laval University, who will study "Pascal et l'existentialisme" at the University of Paris.

Two Rutherford Memorial Scholarships of $500 were awarded, to supplement National Research Council post-doctoral fellowships. Dr. John Francis Cochran will study at the Clarendon Laboratory, Oxford, under Dr. H. Mendelssohn. Dr. Jack S. Greenberg will continue work in nuclear physics at the Zurich Institute of Technology, under Professor P. Sherrer.

Canadian Government Overseas Awards were offered for the fourth time in 1955. Certain revisions were made in the Regulations before the competition began, and it is expected that a further revision will be made before the fifth series is announced.

Twelve fellowships and sixteen scholarships were awarded for 1955–1956. The recipients were:

Fellowships

Music
William Amtmann
Jean Coulthard Adams

Archaeology
Gilbert Bagnani

Painting
Charles Comfort
Ernst Neumann

Art
Sylvia Daoust
Omer Parent
Marius Plamondon

Philosophy
James A. Doull

Chemistry
Marcel Rinfret

Literature
Alain Grandbois
Wilfred Watson

Scholarships

Music
Aline Legrand

Classics
Orville G. Conner*

Painting
Helmut J. Becker

Sculpture
Frances M. Gage

Law
André Morel*

Linguistics
Mimi Beaudry

Philosophy
Charles M. Taylor

Economics
John F. Bosher

Political Science
Maurice Pinard

Mathematics
Angus C. Kerr-Lawson

French Literature
Dante A. Lenardon
Alistair R. MacKay
Lloyd H. Person

Geography
Yves Martin
Serge H. Richard

Theatre
Robert Prévost

*Renewal. Two scholarships were renewals of awards made last year. No fellowships were renewed.

During the year the Organization Committee and the Committee on Plans completed the revision of the Society's By-laws. The draft of the revision was presented to the Annual Meeting, and with certain modifications, was accepted. A copy of the revised By-laws was sent to every member of the Society.

The Publications Committee met twice to discuss policy. The question of quarterly publications was discussed. It was strongly recommended that Section editors should begin their term in January or February, in order to be with the Transactions from the beginning, each year, rather than start in June, when the current issue was already well under way. A beginning is to be made on an Author Index for the years 1942–1954.

Mr. James C. McKegney submitted his resignation from the position of Executive Secretary, with effect from September 17, 1955, and was succeeded by Mrs. Léa Métivier.

There were eleven retirements: Maurice Hébert, Section I; C. T. Currelly, R. K. Gordon, G. Humphrey, H. Michell, H. A. Thompson, Section II; J. A. Gray, Section III; A. L. Parsons, B. R. MacKay, H. C. Cooke, Section IV; and H. T. Gussow, Section V.

ANNUAL MEETING

The seventy-fourth annual meeting was opened in Hart House Theatre, University of Toronto, at 10 A.M., June 6. The following Fellows registered:

Fellows Unattached

Vandry, Monseigneur F.

Section I

Beauchesne, Arthur; Bruchési, Jean; Chauvin, Jean; Daviault, Pierre; d'Eschambault, l'abbé Antoine; Elie, Robert; Lebel, Maurice; Lorrain, Léon; Lortie, Léon; Maurault, Mgr Olivier; Melançon, Claude; Plouffe, Adrien; Régis, Louis-Marie, O.P.; Sylvestre, Guy

Section II

Alexander, Henry; Angus, H. F.; Bailey, A. G.; Bladen, V. W.; Brown, G. W.; Brady, A.; Britnell, G. E.; Clark, A. F. B.; Collin, W. E.; Creighton, D. G.; Elliott, G. A.; Fowke, V. C.; Frye, H. N.; Goudge, T. A.; Keirstead, B. S.; Knox, F. A.; Lamb, W. Kaye; Landon, Fred; Lodge, R. C.; Longley, R. S.; Lower, A. R. M.; MacGibbon, D. A.; MacGregor, D. C.; Mackintosh, W. A.; Masters, D. C.; McIlwraith, T. F.; Muckle, Rev. J. T.; New, C. W.; Pacey, W. C. D.; Phelan, G. B.; Phelps, A. L.; Pratt, E. J.; Priestley, F. E. L.; Raymond, W. O.; Rose, W. J.; Sage, W. N.; Salmon, E. T.; Salter, F. M.; Scott, F. R.; Scott, R. B. Y.; Shaw, J. E.; Sissons, C. B.; Smith, S. E.; Soward, F. H.; Stacey, C. P.; Stanley, C.; Stanley, G. F. G.; Talman, J. J.; Thomson, J. S.; Timlin, Mabel F.; Underhill, F. H.; Wilkinson, B.; Woodhouse, A. S. P.; Meek, T. J. (retired)

Section III

Archibald, W. J.; Beals, C. S.; Beatty, S.; Bell, R. E.; Bernstein, H. J.; Coxeter, H. S. M.; Crawford, M. F.; Darwent, B. de B.; Davies, F. T.;

Dearle, R. C.; Derry, D.; Duckworth, H.E.; Elliott, L. G.; Flood, E. A.; Gagnon, P. E.; Gaudry, Roger; Giguère, Paul-A.; Gilchrist, L.; Gordon, A. R.; Hachey, H. B.; Henderson, J. T.; Hogg, Helen S.; Howlett, L. E.; Hurst, D. G.; James, R. D.; Keys, D. A.; Kulka, M.; Laurence, G. C.; LeRoy, D. J.; Maass, Otto; Macphail, M. S.; Manske, R. H.; Marion, Léo E.; Marshall, J. S.; McCallum, K. J.; McKinley, D. W. R.; McLay, A. B.; Misener, A. D.; Morrison, J. A.; Munro, L. A.; Patterson, John; Petrie, R. M.; Pickup, Eric; Pringle, Robert; Puddington, I. E.; Risi, J.; Robinson, G. de B.; Scherk, Peter; Shrum, G.M.; Steacie, E. W. R.; Thomson, A.; Thorvaldson, T.; Volkoff, G. M.; Walker, O. J.; Watson, W. H.; Welsh, H. L.; Wetmore, F. E. W.; Williams, W. L. G.; Winkler, C. A.; Woonton, G. A.; Wyman, Max; Robertson, J. K. (retired)

Section IV

Alcock, F. J.; Ambrose, J. W.; Baker, M. B.; Berry, L. G.; Bostock, H. S.; Brownell, G. M.; Byers, A. R.; Camsell, C.; Clark, T. H.; Douglas, G. V.; Edmunds, F. H.; Fraser, H. J.; Frebold, Hans; Fritz, Madeleine A.; Gill, J. E.; Gunning, H. C.; Gussow, W. C.; Hawley, J. E.; Harrison, J. M.; Henderson, J. F.; Hume, G. S.; Hurst, M. E.; James, W. F.; Jones, I. W.; Lang, A. H.; Langford, G. B.; MacKay, B. R.; Mawdsley, J. B.; Moore, E. S.; Okulitch, V. J.; Osborne, F. F.; Robinson, S. C.; Russell, L. S.; Satterly, J.; Sproule, J. C.; Stevenson, J. S.; Tanton, T. L.; Thomson, J. E.; Warren, H. V.; Williams, M. Y.; Wilson, J. Tuzo; Wilson, M. E.

Section V

Bailey, D. L.; Bannan, M. W.; Cameron, T. W. M.; Campbell, W. R.; Cantero, A.; Clemens, W. A.; Collier, H. B.; Collip, J. B.; Cook, W. H.; Craigie, E. H.; Craigie, J. H.; Dansereau, P.; Dauphinee, J. A.; Dunbar, M. J.; Dymond, J. R.; Eagles, B.; Ettinger, G. H.; Ferguson, J. K.; Fisher, K. C.; Fry, F. E. J.; Gibbons, N. E.; Gibbs, R. D.; Grace, N. H.; Graham, D. A.; Groves, J. W.; Hanna, W. F.; Hayes, F. R.; Heimburger, C. C.; Huntsman, A. G.; Hutchinson, A. H.; Krotkov, G.; Larmour, R. K.; Ledingham, G. A.; Lochhead, A. G.; Macklin, C. C.; Maheux, Georges; Mainland, D.; McCalla, A. G.; McFarlane, W. D.; Moorhouse, V. H. K.; Murray, E. G. D.; Newton, Margaret; Orr, J. H.; Pagé, E.; Quastel, J. H.; Raymond, Marcel; Senn, H. A.; Scott, D. A.; Shaner, R. F.; Sifton, H. B.; Speakman, H. B.; Thompson, W. P.; Tremblay, J.-L.; Venning, Eleanor H.; Wasteneys, H.; Wynne, A. M.; Young, E. Gordon

The meeting was called to order by the President, Dr. E. W. R. Steacie, who welcomed the Fellows and their guests and expressed the gratitude of the Society to the University of Toronto for its generosity in playing host to the Society. Dr. Sidney Smith, President of the University of Toronto, then welcomed the Fellows in the following words:

MR. PRESIDENT, FELLOWS of the Royal Society of Canada:

It is indeed an honour and a pleasure to welcome this august body to the University of Toronto. I express to you all our delight in seeing you here, our good wishes for you at your future meetings, and my personal sympathy with you at the present moment. I, too, have attended conferences; I have sat where you sit, and have listened at opening meetings to the remarks—not oratory—of local dignitaries—governmental, civic, ecclesiastic or academic. I, too, have wondered when, if ever, they would end their platitudinous perorations and allow us to get on with the real business of the meeting.

Of all the congeries of learned societies that have conglomerated and confabulated during the last few days, the Royal Society of Canada is the senior by many years and in many respects. (No member of any society should take exception to the terms I have just used: conglomerate, meaning to collect into a coherent mass, and confabulate, meaning to chat and not to orate). Since its founding in 1882 the Royal Society has played an increasingly significant role in Canada's development. It should not be a mutual admiration society. Indeed, it has been, if I may mix my metaphors, a clearing-house and a stamping-ground for scholars and scientists (I did not say scholars or scientists) within and outside universities. The liaison thus effected has been beneficial to all, and should be encouraged. It is good for those of us whose lives are spent in universities to be reminded that the royal road to the celestial groves of academe is not a private footpath across the campus.

This Society bears the proud designation of "Royal." This is a very respectable term in Toronto. It is indeed fitting that this should be so, since all its members are travellers on that respectable royal road to learning. I doubt if the members are familiar with the term "royal flush," unless at any time they are in a royal rage and turn royal purple. I presume that Section 5 gives due attention to the royal fish, which include the sturgeon, whale, and porpoise. In view of recent discussion, I share with you ("to share" is becoming current coin in some academic divisions)—I share with you the observation about a mode of conveyance to be found in Shakespeare's King Henry VIII: "By the main assent of all these learned men . . . A *royal train*, believe me."

I notice from the list of papers to be given at your meetings that nearly all of them are the results of individual research. I confess that I have become more than a little sceptical of the value of "research teams" and of "workshops" which seek to shatter the walls of ignorance by concerted blasts on a miscellany of academic trumpets. Good research is not the result of the mastering of techniques or of the conscientious expenditure of energy, valuable as they may be. It is the result of a synthesis of the material informed by the imagination of the searcher. Tough interdisciplinary co-operation is valuable and all too rare; but no important piece of research will result from merely placing side by side fragments of knowledge collected from a number of disciplines; research, as you well know, like artistic creation, is a lonely and austere searching, and, in its final stages, must be a highly personal process.

The stage where the sharing of results is really profitable for all concerned is at meetings such as the present conference. To hear a paper given, and to discuss it and talk to its author about it, brings a stirring stimulus, an immediate pleasure and a lasting satisfaction, which are not obtained merely from reading it in print. I hope that your meetings will be lively and your arguments keen. I am sure that you will enjoy them.

Fully conscious of the dichotomy between the roles of speakers and of listeners, I realize that no speech is ever long enough for the speaker or short enough for the hearers. Exercising the privilege of a host, I now make the suggestive observation: proceed with the real business of the meeting.

The President called for a motion to approve the minutes of the last Annual Meeting. It was moved by Dr. G. S. Hume, seconded by Dr. R. D. Gibbs, that the Minutes be approved. CARRIED.

The election of twenty-four new Fellows, as listed in the Report of Council, was moved by Dr. Georges Maheux, seconded by Dr. N. H. Grace. CARRIED: M. l'abbé Antoine d'Eschambault, Robert Elie, Section I; T. A. Goudge, W. C. D. Pacey, Malcolm Ross, R. B. Y. Scott, G. W. Simpson, B. Wilkinson, Section II; Robert E. Bell, Douglas Derry, James A. Morrison, Eric Pickup, Robert Pringle, F. E. W. Wetmore, Section III; A. R. Byers, Hans Frebold, W. C. Gussow, J. C. Sproule, Section IV; A. Cantero, N. E. Gibbons, W. S. Hoar, E. Pagé, H. A. Senn, Eleanor H. Venning, Section V.

Those present were formally presented to the President of the Society by the presidents of the Sections. They received diplomas and signed the Charter Book. Dr. W. S. Hoar, Section V, was absent. Dr. Paul A. Giguère, Dr. Hugh MacLennan, Dr. J. H. Quastel, Dr. Marcel Raymond, and Dr. Edward T. Salmon, who had been elected in 1954, received diplomas and signed the Charter Book.

The Honorary Secretary presented the Report of Council and stated that he had nothing to add to that which was found in the report. He referred it to the Sections for approval.

The President stated that Dr. T. W. M. Cameron had a motion to present, concerning the By-laws. He stated further that, since the question of the revision of the By-laws would require much thought and thorough discussion, it might be preferable to discuss it in the Sections and bring it up again for discussion at the final general meeting, on Wednesday.

It was moved by Dr. T. W. M. Cameron, seconded by Colonel C. P. Stacey, that the revision of the By-laws be referred to the Sections to be discussed at the final general meeting. CARRIED.

The meeting was adjourned at 11 A.M.

Sectional meetings were held on the 6th, 7th, and 8th of June.

On the afternoon of Monday, June 6, the Fellows and their wives had the unusual privilege of being taken on a tour of the University of Toronto Press. The tour was followed by a delightful reception.

On Tuesday afternoon, at 4.30, the President of the University of Toronto and Mrs. Sidney Smith entertained the Fellows, their wives, and visitors at a most enjoyable informal reception held at the residence of the President, 86 Queen's Park. Following the reception, a sumptuous dinner was held in the Great Hall, Hart House, for the Fellows and their wives.

Informal entertainment was provided by most of the Sections for their members.

The second general meeting of the Society was held at 3.00 P.M., Wednesday, June 8th.

It was moved by Dr. G. M. Volkoff, seconded by Dr. W. K. Lamb, that the Report of Council be adopted. CARRIED.

The Report of the General Nominating Committee was read by Colonel C. P. Stacey, who moved, seconded by Dr. Adrien Plouffe, that the report be adopted. CARRIED.

Dr. G. S. Hume took the chair and expressed his sincere thanks and humble appreciation of the honour which the Society had paid him in electing him to the Presidency. Dr. Hume paid tribute to Dr. Steacie for the outstanding way in which he had led the Society in the preceding year. He remarked that the Society had taken on new life and hoped that in the coming year that vigour could be sustained and increased.

Reports were received from the Sections. It was agreed that discussion of the revision of the By-laws should not be brought up during the reports from the Sections, but discussed after the other business of the meeting had been dealt with.

A motion of thanks to the outgoing President and Council, for the excellent way in which they had conducted the affairs of the Society in 1954–55, was made by Dr. W. L. G. Williams and seconded by Professor W. E. Collin. CARRIED.

Dr. P. E. Gagnon, seconded by Dr. G. M. Shrum, moved a vote of sincere thanks to the University of Toronto for its hospitality in providing such excellent accommodation for the Fellows of the Society and their wives in the residences, and for the meetings of the Society, in the various University buildings. CARRIED.

Other motions of thanks were:

To the University of Toronto Press, for the tour and reception on Monday afternoon. Moved by Dr. Watson Kirkconnell, seconded by Dr. R. S. Longley. CARRIED.

To the Sectional Entertainment Committees which arranged hospitality for the members of the various Sections and their wives. Moved by Dr. M. S. Macphail, seconded by Dr. C. S. Beals. CARRIED.

To the University of Toronto, for the excellent dinner provided on Tuesday evening. Moved by Dr. J. S. Thomson, seconded by Dr. D. A. MacGibbon. CARRIED.

To Dr. Sidney Smith, President of the University of Toronto, for the reception at his residence for the Fellows and their wives and visitors. Moved by Monseigneur Vandry, seconded by Dr. Adrien Plouffe. CARRIED.

To the ladies and gentlemen of the Press, for their conscientious coverage of the meetings. Moved by Dr. R. D. Gibbs, seconded by Dr. E. Gordon Young. CARRIED.

At Dr. Hume's request, Dr. T. W. M. Cameron now presented an outline of the changes which had been incorporated in the revised By-laws. There was a lengthy discussion of the revision, and several of the suggested changes were rejected by the meeting before agreement was reached. Copies of the revised By-laws are to be sent to all members.

It was agreed to accept Mgr Maurault's cordial invitation to hold the next meeting at the University of Montreal.

Hearty approval was expressed of Dr. N. H. Grace's motion of thanks to Dr. Cameron and his committee for the magnificent job they had done in preparing the revision of the By-laws.

The meeting was adjourned at 4.30 P.M.

An Oceanography Session was held at 8.30 P.M., Wednesday.

PRESENTATION OF MEDALS

Médaille Pierre Chauveau

Jean-Marie Gauvreau

Monsieur le président:

La Société royale attribue, cette année, sa Médaille Pierre Chauveau à un écrivain scientifique, spécialisé dans les arts appliqués, M. Jean-Marie Gauvreau, à qui l'on doit d'avoir fait renaître l'artisanat et la petite industrie, au pays de Québec, et de leur avoir donné une orientation nouvelle en adaptant l'un et l'autre au goût et à notre mode de vie modernes.

Diplômé de l'Ecole Technique de Montréal, de la Faculté des lettres de l'Université de Montréal, ainsi que de l'Ecole Boulle de Paris, le premier étranger à recevoir cette distinction, M. Gauvreau, à son retour d'Europe, obtint du gouvernement du Québec la fondation de l'Ecole du Meuble, une école d'arts appliqués, la seule du genre en Amérique, qu'il dirige depuis vingt ans. Il a également fondé, en 1945, sous l'égide du ministère du commerce et de l'industrie, l'Office provincial de l'Artisanat et de la Petite Industrie dont il est le président.

Docteur en sciences sociales, économiques et politiques de l'Université de Montréal, membre de la Société royale depuis 1942, M. Gauvreau fait de l'enseignement non seulement à son Ecole du Meuble mais aussi à l'Université de Montréal où il est professeur agrégé, à l'Université Laval (histoire des arts décoratifs), à l'Ecole Supérieure de pédagogie familiale d'Outremont et à diverses écoles de sciences domestiques du Québec.

L'œuvre écrite de M. Jean-Marie Gauvreau est déjà considérable et c'est pour l'ensemble de ses travaux, trois ouvrages et une multitude d'essais sur l'artisanat, l'histoire et la critique d'art, les arts appliqués, l'ébénisterie et la technologie du bois, que la Société royale lui décerne la Médaille Pierre Chauvreau.

Jean Chauvin

Flavelle Medal

Charles Samuel Hanes

Mr. President:

Charles Samuel Hanes has distinguished himself in many fields of endeavour. As a scientist, he has made contributions to the *in vitro* biosynthesis of starch and peptides which have gained him an international reputation; as an administrator, he has held such senior positions as the Director of the Food Investigations Board of Great Britain; as a liaison officer and adviser during the war years, he served the British Government with distinction throughout the Commonwealth; finally, as an educator, he has

been a member of the senior staff of the University of Cambridge and the University of Toronto.

Born in Toronto in 1903, he graduated with high honors in biology at the University of Toronto in 1925 and was awarded the 1851 Exhibition Scholarship. After completing his Ph.D. at Cambridge, he remained for two additional years as a senior Exhibition Scholar. Although he returned to Canada several times in various capacities, Cambridge was his real home until 1951. In that year he became Professor of Biochemistry at the University of Toronto. It is a privilege and honour to have him with us again.

Much of Dr. Hanes' early research was concerned with the degradation of starch by amylases and he wrote a classic monograph on this subject. In March, 1940, he reported the first enzymic synthesis of amylose, a contribution considered as the outstanding biochemical achievement of the year. Elected to the Royal Society in 1942, he was then one of its youngest fellows, an outstanding tribute to his scientific attainments.

With the advent of war Dr. Hanes' abilities in other fields were recognized by the British Government. He became Scientific Adviser to the British Food Mission in North America and during this period established his superlative qualities as an administrator. This led to his appointment as Director of the Food Investigations Board of Great Britain in 1944. Here he followed in the steps of such men as Sir William Hardy and had under his direction all of the Board's laboratories, including the Low Temperature Research Station at Cambridge, where he had worked as a staff member.

Dr. Hanes never resigned his first love for scientific experimentation and in 1947 he joined the staff of Cambridge University as a Reader in biochemistry. In a few years his work on the enzymic synthesis of peptides placed him with that select group who have contributed effectively to our knowledge of protein synthesis.

Dr. Hanes' personal qualities, his open friendliness and generosity, have won him a legion of friends. His advice on all manner of major and minor problems has been sought, not only by students but by senior scientific personnel. He has thrived on interruption and still maintained that peace of mind essential to progressive scientific investigation. It is a pleasure to present so worthy a recipient of this high honour—the Flavelle Medal.

W. H. Cook

Henry Marshall Tory Medal

Edgar William Richard Steacie

Mr. Chairman:

Dr. Steacie, from his years as a student, has continuously and consistently devoted himself to original research in the manner to which all members of this Society aspire. Dr. Steacie was born in Westmount, Quebec, on the auspicious date December 25, 1900. His undergraduate studies were pur-

sued at McGill University, where he continued graduate studies as a National Research Council student, and received the doctorate in 1926. Later on he broadened his experience and training in England and on the Continent.

After a distinguished career at McGill, Dr. Steacie joined the National Research Council as Director of the Division of Chemistry. At both institutions he has carried on a formidable programme of research in that branch known as chemical kinetics. His researches and those of the students he trained and inspired have brought renown to themselves and prestige to their institutions. His contributions to the chemistry of photosensitized reactions are original and fundamental. His book on free radical reactions is everywhere recognized as the authoritative work in the field.

Dr. Steacie's contributions do not end with research and training. His qualities of leadership have brought him to the councils and the chairs of learned societies and national scientific bodies. In 1949 he was elected President of the Chemical Institute of Canada, this year he is President of our own Society; he serves on the Defence Research Board, and the Atomic Energy Control Board; in 1950 he was appointed a Vice-President of the National Research Council and, since 1952, has been President of that institution.

As an administrator Dr. Steacie's contributions to science continue. His initiation of the post-doctoral fellowship plan is of lasting value. Although President of the National Research Council with many duties, his activities as a chemist are not curtailed as shown by the continuous flow of his scientific papers.

Dr. Steacie's many contributions have been widely recognized. In 1948 he was elected to the Royal Society of London; in 1949 he was awarded the gold medal of the Professional Institute; in 1953 he received the medal of the Chemical Institute. His wartime services brought recognition in the form of an O.B.E. No less than eight universities have conferred upon him honorary degrees.

Mr. Chairman, Section III is proud to present Dr. Steacie for the Henry Marshall Tory Medal.

R. N. PETRIE

LORNE PIERCE MEDAL

William Bruce Hutchison

MR. PRESIDENT:

I have the honour to present to you Mr. William Bruce Hutchison for the Lorne Pierce Medal. Mr. Hutchison was born at Prescott in 1901. In the course of his newspaper work he became a political reporter at Ottawa in 1925. Between 1944 and 1950 he was associate editor of the *Winnipeg*

Free Press. Since 1950 he has been editor of the *Victoria Daily Times*. Mr. Hutchison's interests, however, extend far beyond the daily round of his profession.

He is the author of *The Unknown Country: Canada and her People* (1942) which was written in the belief that "Canada is, among the important nations of the world, the least known in its real content." The book, widely read, received the Governor-General's award as the outstanding non-fiction book of the year. In 1944 he ventured into the field of fiction with a volume entitled *The Hollow Men*. In 1950 his story of the Fraser River was issued as the forty-second volume in the American series on the Rivers of America. In 1952 came *The Incredible Canadian: A Candid Portrait of Mackenzie King, his Works, his Times and his Nation*. Recently his fascinating study of "The Struggle for the Border" has appeared in *Maclean's* and no doubt will be available in due course in book form.

Mr. Hutchison does not come from an unknown country nor is he an incredible Canadian, but is known to us as one of our most distinguished journalists, deeply interested in Canada, with an intimate knowledge of Canadian political affairs. Mr. President, Mr. Hutchison merits the high honour of receiving from the Royal Society of Canada the Lorne Pierce Medal.

D. A. MacGibbon

Tyrrell Medal

Charles Perry Stacey

Mr. President:

I have the honour to present to you for the Tyrrell Medal, Colonel Charles Perry Stacey, Director of the Historical Section of the Canadian General Staff. Colonel Stacey was born at Toronto in 1906. He was graduated from the University of Toronto as Bachelor of Arts in 1927 and received the same degree from the University of Oxford in 1929. In 1931 he became a Master of Arts of Princeton University. In 1937 he received the degree of Doctor of Philosophy from that institution. Subsequently he joined the Princeton staff in the Department of History where he remained until the advent of Word War II.

Mr. Stacey early interested himself in military affairs, joining the non-permanent active militia in 1924. He went on the reserve of officers when going to the United States in 1929, and remained in that status until 1940, when he was appointed Historical Officer at Canadian Military Headquarters in London. He held this position until the close of the war. In recognition of his services he was made an Officer of the Order of the British Empire. Colonel Stacey has also received the Canadian Forces Decoration.

His most important published works are: *Canada and the British Army*,

1846–71 (1936); *The Military Problems of Canada* (1940); *Canada's Battle in Normandy* (1946); and *The Canadian Army 1939–45* (1948). The last volume received the Governor-General's award in non-fiction for that year.

In 1951 Dr. Stacey was elected a Fellow of the Royal Society of Canada. He has also been honoured by his confrères by being chosen president of the Canadian Historical Association for 1952–3. As the historian of the Canadian Army, the importance of Colonel Stacey's work speaks for itself. Mr. President, I commend to you Charles Perry Stacey as a most worthy recipient of the Tyrrell Medal.

D. A. MacGibbon

Willet G. Miller Medal

John Tuzo Wilson

Mr. President:

The Committee for the award of the Willet G. Miller Medal have selected Dr. John Tuzo Wilson as the recipient for this year.

The terms of award are: that it is to be awarded biennially to persons resident in North America who have made an outstanding mark in the field of geology or allied sciences; and, that the recipients be in their prime —not too old to continue such original work.

Dr. Wilson graduated from Trinity College of the University of Toronto in the Physics and Geology course in 1930, winning a Massey Fellowship for study overseas, the Coleman Gold Medal in Geology, and the Governor-General's Medal for the most outstanding graduate of the year from Trinity College. After two years at Cambridge he received an M.A. and in 1936 received a Ph.D. degree from Princeton University. For this he wrote a thesis upon a geological survey of a part of the Beartooth Mountains, Montana. He took enough time off from this job to make the first ascent of Mt. Hague, Montana—elevation 12,100 feet.

In 1936 he joined the staff of the Geological Survey of Canada. In 1939, at the outbreak of war, he was granted leave of absence and was commissioned in the 1st Tunnelling Company, Royal Canadian Engineers. After spending four years overseas he returned to National Defence Headquarters as Director of Operational Research with the rank of Colonel. He was Deputy Director of Exercise Musk Ox during the winter of 1945–6 and flew as a Canadian observer on the first United States Air Force flight over the pole. He was created an officer of the Order of the British Empire and of the Legion of Merit (United States).

In 1946 he was appointed Professor of Geophysics in the Department of Physics, University of Toronto. In 1950 he went to Australia as Visiting Professor of the Australian National University obtaining a Carnegie Corporation grant to enable him to visit Africa on the way. He received the

R. M. Johnston Memorial Medal of the Royal Society of Tasmania. In 1952 he made a tour of the western United States as Distinguished Lecturer for the Society of Exploration Geophysicists, and spent a short time doing field work in Peru.

Dr. Wilson's publications are numerous and varied; they comprise forty maps, reports, and papers. Most have to do with geological or geophysical matters, some are on military topics, and a few deal in a lighter vein with such subjects as travel and matters of interest in the Arctic. In the words of one of the members of the Committee, "While Dr. Wilson has contributed importantly on his own account, I think most of us have been more impressed by the stimulus he has provided to other geologists and geophysicists and his effectiveness in getting physicists to work on geological problems. In this respect he has been truly outstanding."

Mr. President, I have the honour to present Dr. John Tuzo Wilson and ask that you bestow on him the Willet G. Miller Medal.

J. B. MAWDSLEY

REPORTS OF SECTIONS

Rapport de la Section I

La Section I a tenu quatre réunions auxquelles ont assisté seize sociétaires et plusieurs visiteurs.

La Section I a consacré une séance à la discussion des affaires courantes. Elle a pris connaissance en tout ou en partie des dix-sept communications inscrites au programme.

La Section I prie le Conseil général de déclarer deux fauteuils vacants et d'accepter la demande de M. Maurice Hébert qui désire être mis à sa retraite.

La Section I a adopté le rapport du Conseil. Elle a aussi étudié le projet de règlement.

La Section I regrette le décès de deux de ses membres, MM. René Guénette et Antonio Perrault.

La Section I recommande qu'à l'occasion du 75e anniversaire de la Société Royale le Conseil fasse dresser l'index analytique des mémoires de la Société.

Notre Section déplore qu'il n'y ait pas eu, cette anné, de séance conjointe avec la Section II et émet le vœu que cette pratique, rétablie en 1952, soit reprise chaque année.

Les élections ont donné les résultats suivants:

Président : M. Eugène L'Heureux
Vice-président : M. Jean-Marie Gauvreau
Secrétaire : Dr Adrien Plouffe
Représentant additionnel au Conseil : M. Claude Melançon
Comité général d'édition : Président, Dr Adrien Plouffe, MM. Léon Lorrain, Donatien Frémont
Comité de la Médaille Chauveau : MM. Eugène L'Heureux, Jean-Marie Gauvreau, Pierre Daviault, Robert Elie, Léon Lortie
Comité de la Médaille Tyrrell : MM. Eugène L'Heureux, Jean-Marie Gauvreau, Antoine Roy
Comité de la Médaille Lorne Pierce : MM. Eugène L'Heureux, Jean-Marie Gauvreau, Antoine Roy
Comité général des candidatures : MM. Eugène L'Heureux et Adrien Plouffe
Comité des candidatures : MM. Eugène L'Heureux, Jean-Marie Gauvreau, Adrien Plouffe, Léon Lorrain, Pierre Daviault, Gérard Morisset
Comité des bourses : Président, M. Maurice Lebel, M. Jean Bruchési, le R.P. Louis-Marie Régis, le R.P. Georges-Henri Lévesque, M. Jean Vallerand
Comité des plans et projets : M. Léon Lortie

Comité du programme : Président, MM. Eugène L'Heureux, Jean-Marie Gauvreau, Adrien Plouffe

Il est proposé par Adrien Plouffe, appuyé par M. Jean Bruchési, que le rapport de la Section I soit adopté.

Report of Section II

Section II held two business meetings, three general sessions, two "social science," and two "literature" sessions. Sixty-five fellows attended and there were many visitors. In addition to the President's address sixteen papers were read. Special mention should be made of the Symposium on "A. J. Toynbee and the Philosophy of History" which attracted a very large group (over 159).

The following officers were elected:

President: J. S. Thomson
Vice-President: W. Kaye Lamb
Secretary: S. D. Clark
Additional Member of Council: F. R. Scott
Programme and Editorial Committee: F. R. Scott (*Chairman*), S. D. Clark, Henry Alexander, Hugh MacLennan, K. W. Taylor
Selection Committee: Kaye Lamb, J. S. Thomson, S. D. Clark, V. C. Fowke, F. E. L. Priestley, E. T. Salmon
Representatives on the Lorne Pierce Medal Committee: J. S. Thomson, Kaye Lamb, F. M. Salter
Representatives on the Tyrrell Medal Committee: J. S. Thomson, Kaye Lamb, D. G. Creighton
Scholarship Committee for Section II: J. S. Thomson, Kaye Lamb, J. A. Corry (*Chairman*)
Representatives on the General Nominating Committee: C. P. Stacey, S. D. Clark

The Report of Council was approved.

The Section noted with deep regret the deaths of Skuli Johnson, W. D. Lighthall, Gilbert Norwood, and B. K. Sandwell.

The Section noted the transfer to the retired list of C. T. Currelly, R. K. Gordon, G. Humphrey, H. Michell, and H. A. Thompson.

The Section asks permission to elect six Fellows in 1956.

It was moved by V. W. Bladen, and seconded by J. S. Thomson, that this report be adopted and that permission to elect six Fellows be granted.

Report of Section III

The Section held two business meetings and a total of twelve scientific sessions. Three of these were symposia, one of which was a joint session with Section IV. Of the 119 papers on the programme over 90 were actually presented.

The Section welcomed six new Fellows and noted with deep regret the deaths of eight of its members. Fifty-nine Fellows and six visitors signed the attendance book.

The Section had the pleasure of participating in the presentation to Dr. Otto Maass of the special number of the *Canadian Journal of Chemistry* published in his honour.

The Section accepted with regret the request of Dr. J. A. Gray, F.R.S., that his name be transferred to the list of Retired Members. Elected to Fellowship in 1922, Dr. Gray has been a stalwart supporter of the Society and of Section III.

The following officers and committee members were elected:

President: W. H. Watson
Vice-President: H. S. M. Coxeter
Secretary: A. D. Misener
Additional Member of Council: R. M. Petrie
Tory Medal Committee: no award; Committee to be appointed next year.
Committee for the Selection of New Fellows: The Officers of the Section, Léo Marion (*Chairman*), D. J. LeRoy, A. McKellar
Sectional Editorial Committee: D. A. Keys (*Chairman*), R. L. Jeffery, T. Thorvaldson
Editorial Board of the Canadian Journal of Research: G. M. Volkoff, T. Thorvaldson
Members of the General Nominating Committee: The President and Vice-President of the Section
Committee for the Award of R.S.C. Scholarships: J. S. Foster (*Chairman*), C. S. Beals, R. L. Jeffery, P. Giguère
Representative on the C.I.C. Medal Committee: E. W. R. Steacie
Representative on the Canadian National Committee of the International Union of Pure and Applied Chemistry: J. W. T. Spinks
Representative on the Canadian National Committee of the International Union of Pure and Applied Physics: A. D. Misener

The Section formally accepted the report of Council.

At the request of Council the Section considered the proposed revision of the By-laws. The discussion resulted in a number of resolutions which will be presented to this meeting at the appropriate time.

The Section requests that it be allowed to elect six new Fellows in the coming year 1956, unless the question of election of Fellows is decided by adoption of some By-law at this meeting.

Report of Section IV

Section IV held five sessions including two business meetings and two symposia, one on the "Grenville Problem" and one held jointly with Section III on Geochronology and Geophysics. The sessions were attended by 70 Fellows and guests.

The Section notes with deep regret the deaths of four of its Fellows: Dr. C. E. Cairnes, Dr. J. A. Dresser, Dr. R. C. Wallace, and Dr. J. A. Allan.

Four new Fellows: A. R. Byers, W. L. A. H. Frebold, W. C. Gussow, and J. C. Sproule were elected and presented to the Society.

The following officers and representatives were elected for the Section:

President: J. E. Hawley
Vice-President: H. C. Gunning
Secretary: H. S. Bostock
Additional Member of Council: J. B. Mawdsley
General Nominating Committee: I. W. Jones, J. E. Hawley
Editorial Committee for the Transactions of 1956: L. G. Berry (*Chairman*) and the other members of the Committee to be chosen from among the Fellows at Kingston.
Committee for Nominations to Section IV: J. E. Gill (*Chairman*), G. S. Mackenzie, J. Satterly, V. J. Okulitch, L. G. Berry, D. R. Derry
Committee on the Royal Society of Canada Fellowships: E. S. Moore (*Chairman*), H. J. Fraser, and I. W. Jones
Committee for the Willet G. Miller Medal (this committee will decide the award for 1957 and stands until then): L. S. Russell (*Chairman*), A. E. Wilson, F. F. Osborne, A. R. Byers, J. S. Stevenson
Planning and Programme Committee: J. T. Wilson (*Chairman*), J. E. Gill, H. C. Gunning, J. E. Hawley

The requests of three Fellows, A. L. Parsons, B. R. MacKay, and H. C. Cooke, to be placed on the retired list and that R. P. D. Graham, who wrote shortly before the Annual Meeting last year but was not included in the Report of the Section, are accepted with regret and recommended to Council.

The Section plans to include the Soil Sciences among those allied to Geology.

During the second business meeting of the Section the proposed revisions of the By-laws of the Society were discussed section by section. The main points suggested were:

1. That in Article 2, second sentence, the words ". . . in the nature of an academy" might be omitted. This was suported by a small majority.

2. That Article 12 (1) should read "Fellows introducing motions to change the By-laws of the Society shall give notice thereof at least two months before the general meeting, and the Honorary Secretary shall pre-

pare a printed list of such motions and submit it to the Fellows at least one month before the first day of the meeting." Also that the second part of the paragraph as proposed in the revision of the By-laws be omitted until Article 9 is settled. These two points were approved unanimously.

3. That Article 9 be omitted from the revision and referred back to the Committee on Plans for reconsideration and that the numbers of Fellows to be elected annually for Sections III, IV, and V remain at 6, 4, 6. Also that the sentences saying "The total number of Fellows in Sections III, IV, and V shall not be limited" are unnecessary.

J. B. Mawdsley was directed to present these views at the General Meeting or to support motions put forward along similar lines by Fellows of the other sections.

It was moved by H. S. Bostock, seconded by I. W. Jones, that this report be accepted.

Report of Section V

Fifty-five Fellows and a large number of guests were in attendance at the meetings of the Section, and fifty-one papers were presented.

The Section held two business meetings. It met as a whole on Monday afternoon for the Presidential Address by Dr. E. G. D. Murray, who spoke on "The Balance of Bacterial Virulence," and for a symposium of four papers on Biological Research and Education. The section named a committee of Dr. K. C. Fisher (Chairman), Dr. W. H. Cook, and Dr. R. D. Gibbs to study the question of Biological Research and Education and to report its findings to the Section next year. On Tuesday morning the Section heard papers of general interest but divided in the afternoon into subsections on Medical Science and on Botany and Zoology. On Wednesday morning and afternoon meetings of the whole Section were continued.

The Section welcomed six new members, accepted the Report of Council, and approved with regret the transfer of Dr. H. T. Gussow to the retired list. The Section noted with regret the deaths of Dr. J. Dearness, Dr. J. J. DeGryse, Dr. Donald T. Fraser, Dr. C. C. Moore, Dr. G. B. Reed, and Dr. D. Y. Solandt. The Committee appointed at the request of Council in 1954 to consider the Harrison bequest—namely Dr. E. G. D. Murray (Chairman), and Dr. W. H. Cook, with powers to add—has been continued in office and charged with the responsibility of taking any necessary action on the behalf of the Section.

The Section continues to regret its inability to accept a reasonable proportion of the distinguished nominees to fellowship; of the sixty candidates this year only six, of course, could be admitted. While the Section would not wish to admit everyone who is engaged in some phase of biological research, there do seem to be an appreciable number more than the six we have been nominating who should become Fellows. It appears that a number larger than at present would correct the situation. It is to be emphasized

that our difficulty in restricting the Fellowship is the result of the greatly increased importance which, for better or for worse, science now occupies in human affairs. Whereas seventy-five years ago the number of biologists eligible for membership in a national academy was small in relation to the humanities, today it is many times larger. While the Society took account of this many years ago by creating new sections, the great increase of worthy science candidates which has again occurred in the last fifty years has not yet been recognized by appropriate action in respect to membership.

The following officers and committee members were elected for the 1955–6 session:

President: G. MAHEUX
Vice-President: W. H. COOK
Secretary: N. H. GRACE
Additional Member of Council: E. G. D. MURRAY
Editorial Committee: E. HORNE CRAIGIE (*Chairman*), H. B. SIFTON, L. C. SIMARD
Medal Committee, Flavelle Medal: To retire in 1956, W. G. PENFIELD, D. L. BAILEY, W. H. COOK; To retire in 1957, G. H. ETTINGER (*Chairman*), L. DAVIAULT, J. L. HART
Selection Committee: To retire in 1956, A. G. MCCALLA, A. G. LOCHHEAD; To retire in 1957, F. R. HAYES (*Chairman*), G. KROTKOV; To retire in 1958, P. DANSEREAU, W. R. CAMPBELL, and the Secretary
Scholarships Committee: D. L. THOMSON (*Chairman*), J. R. DYMOND, R. POMERLEAU, BLYTHE EAGLES
Representatives on the Editorial Board, Canadian Journals of Research: D. L. BAILEY, T. W. M. CAMERON
Programme Committee: P. DANSEREAU (*Chairman*), M. DUNBAR, N. E. GIBBONS

It was moved by N. H. Grace, seconded by F. R. Hayes, that this report be accepted.

APPENDIX A

DISCOURS PRÉSIDENTIEL
PRESIDENTIAL ADDRESS

PROCEEDINGS OF THE ROYAL SOCIETY OF CANADA
VOLUME XLIX : SERIES III : JUNE, 1955

DISCOURS PRÉSIDENTIEL PRESIDENTIAL ADDRESS

Science and the National Academy
Science et l'Académie Nationale

E. W. R. STEACIE, F.R.S.C.

THERE are certain difficulties in deciding on a subject for the Presidential Address to the Royal Society of Canada. Past addresses have been of various types. In the first place a general discussion of one's own field of work has often been given. This may be both appropriate and interesting in the case of an historian, an economist, or a medical man. The path which connects photochemistry with the general problems of society is, however, a rather tortuous one. It is true that the subject is the basis of both vision and of agriculture, but I think it is better to stay away from it.

The address given by my predecessor last year is an admirable example of a second type. In this he reviewed the aims of the Society and its present status. I naturally hesitate to discuss a subject which was presented in such an able and scholarly way only a year ago.

A third procedure is to discuss general trends in a broad field. I have decided to combine the last two and to give what is essentially a supplement to Dr. Bruchési's address with special reference to science and its position as far as a national academy is concerned. In addition I should like to discuss in a general way certain trends in the position of science. Further, last year Dr. Bruchési explicitly compared the Society with the French Academy. As a scientist I should like to make my comparisons rather with the Royal Society of London.

It is, I think, worth pointing out that when the difficulties or shortcomings of our Society are under discussion two quite distinct aspects of the situation arise. The first is one over which we have complete control—namely the things we do ourselves. Are our meetings properly organized? Are there things we are leaving undone? The second type of criticism, and the most usual one, concerns the actions of others. What is the status of the Society? Are we, as the senior learned society, consulted as frequently and given as much responsibility as we deserve? This latter aspect of the situation is one to which I wish to pay particular attention.

It is of interest to look at the position of science at the time of the foundation of the Royal Society of London in 1662. Superstition and an appeal to authority and tradition were just beginning to give way to the experimental method. As a result, most of the intelligent men of the day were attracted to the new method. Intelligence was required, but little formal knowledge,

hence real work could be done by the gifted amateur. As a result the members were a rather mixed bag. The active participants in discussions included Charles II, members of the aristocracy such as the Duke of Devonshire, "practical" people like Samuel Pepys, poets such as John Dryden, and those, amateurs or others, who gave a major proportion of their time to experiment. Two things are noteworthy; the first is that the Society's influence was great because it included most of the powerful men of the day: in short, science was fashionable. The second noteworthy thing is that science was in a very elementary and almost purely empirical stage. As a result there was no real distinction between the scientist and the inventor.

Over the three centuries which have followed the foundation of the Royal Society, three distinct types of change have occurred which have a profound effect on the present position of science and of the national academy. These changes took place first in science itself; secondly in the places where scientific work is done and in the people who do it; and thirdly in the relation of science and the scientist to society at large.

The first change of importance is that in science itself. At the time of the foundation of the Royal Society the only possible method of approach was a purely empirical one. Experiments were performed and the results noted. There was, therefore, nothing essentially different from the methods which had been used in the practical arts since the dawn of history. What was happening, however, was an attempt to bring order and objectivity into the empirical method. There was, therefore, little fundamental difference in outlook between the scientist and the inventor, or between what we would now call "pure" and "applied" science. However, the going was slow and not much of direct practical use resulted. Essentially science appeared to be a tremendously interesting intellectual pursuit, and highly suitable as an avocation for those of independent means.

As time progressed much was discovered, but the applications were not obvious in the early stages. As a result by the beginning of the nineteenth century science and invention had become quite distinct pursuits. At this point I should like to quote J. B. Conant:[1]

> . . . Popular credit throughout the nineteenth century went largely to the inventor, not to the scientist. This is particularly true in the United States but not much less so in Great Britain. . . . By and large the scientist in the nineteenth century was supposed to be concerned only with discovering nature's laws; the inventor was taking advantage of these discoveries for practical ends. The attitude of James Clerk-Maxwell, the founder of the electromagnetic theory of light, towards the inventor Alexander Graham Bell was one of patronizing condescension (Clerk-Maxwell referred to Bell as 'a speaker, who to gain his private ends, has become an electrician'). Professor Rowland of the Johns Hopkins University, addressing his fellow physicists in 1879, said 'He who makes two blades of grass grow where one grew before is the benefactor of mankind; but he who obscurely worked to find the laws of such growth is the intellectual superior as well as the greater benefactor of the two.' The scientist

[1] *Modern Science and Modern Man* (New York, 1953), p. 16.

looked down upon the inventor and the inventor in turn was a bit contemptuous of the scientist; so too were some of the men of business who backed the inventors in successful enterprises.

In World War I, President Wilson appointed a consulting board to assist the Navy. Thomas Edison was the chairman; his appointment was widely acclaimed by the press—the best brains would now be available for the application of science to naval problems. The solitary physicist on the board owed his appointment to the fact that Edison in choosing his fellow board members had said to the President, 'We might have one mathematical fellow in case we have to calculate something.'

Another story illustrating the popular attitude towards science and invention in 1916 concerns chemists, not mathematicians or physicists. At the time of our entry into World War I, a representative of the American Chemical Society called on the Secretary of War, Newton Baker, and offered the services of the chemists in the conflict. He was thanked and asked to come back the next day. On so doing, he was told by the Secretary of War that while he appreciated the offer of the chemists, he found that it was unnecessary as he had looked into the matter and found the War Department already had *a* chemist.

By 1920, however, the conceptual side of science had advanced to a stage where sufficiently detailed predictions could be made to render the application of science to industry well worth while. As a result, the stock of the scientist rose at the expense of that of the inventor. Today the inventor has mainly been replaced by the scientist in industry, and the distinction between pure and applied science has largely vanished except for the very important question of motive. The result has been a very great alteration in the relation of science to society, and we shall come to this shortly.

The second important change over the years is in the people doing research, and in where they do it. As far as people are concerned we have gone a full cycle since the Middle Ages. In the early days (say prior to the seventeenth century) much of the research was done by professionals. By this I mean that most dukes and kings had a tame alchemist on the premises. He worked in the cellar and all that he did was kept highly secret.

Parenthetically it may be remarked that the business of the alchemist was the transmutation of metals. It is a curious fact that this is the only subject which has ever involved "security" on a large scale. After four hundred years we have come back to transmutation with nuclear energy and have again run into secrecy with all its attendant complications. We are thus back in the Middle Ages in this respect. The only differences are that this time transmutation really occurs, and that the axe is no longer the approved means of enforcing the Official Secrets Act.

This, however, is by the way. To return to the subject under discussion, once modern science commenced to develop in the seventeenth and eighteenth centuries research was mainly a pursuit of the amateur with private means. In the nineteenth century the scientist was usually a "semi-professional," i.e., a university professor who was not obliged to do research, but whose career to some extent depended on it. Today research is largely a matter for the professional. The large laboratory with hired professional

research workers is a very recent development. It raises many problems since no one has yet really discovered how to administer such a laboratory without at least partially destroying the originality and initiative of the scientists.

A major change is also developing in the location of scientific research. Three hundred years ago when workers were amateur and equipment was simple most work was done in private laboratories. The universities were by no means keen on letting science creep in the door and it is only within the last century that it has been regarded as a reasonably respectable university subject. I am sure today that many professors in the humanities regret, with perhaps some justice, that science was ever let into the universities at all. However, until recently almost all scientific work *has* been done in universities, and there is no question that from the point of view of science this is the place for it. It is only within the university atmosphere that a truly objective search for knowledge can be carried on.

Recently, however, with the increasing application of science, and the increasing cost of equipment, more and more research on pure as well as applied science is being carried on in industry. There is a great danger that this trend may destroy the dominant position of the university in science. There is also a danger that the increasing emphasis on technology may destroy the character of the universities themselves. Another factor which bears on the situation is the very great increase in the magnitude of the scientific effort. All these questions raise many problems, and I shall return to some of them later.

A third major change over the past three hundred years is in the relation of science to society and, in particular, to government. I have pointed out above that alchemy and atomic energy both brought restrictions. The reason is, of course, obvious. The knowledge of how to manufacture gold or to produce atomic energy gives great power to those who possess it. The result is both an interest in science and restrictions on its freedom. From a reverse point of view it is interesting to note that Sir Humphrey Davy lectured in Paris during the Napoleonic wars. This was not an example of an enlightened outlook by government on the international freedom of science. It was, rather, an indication of the very low opinion of the usefulness of science.

In the days of the foundation of the Royal Society science did not seem to be of practical value. It was encouraged in a personal way by Charles II, but the government of the day did not have scientists in its employ, at least not as such. As a result science could be quite happily left to a society, and on the rare occasions when advice was needed the Royal Society was consulted. Again, since the Greenwich Observatory, and later the National Physical Laboratory, appeared to be useful but not absolutely essential there was no hesitancy in giving full or partial control to the Society. In short, governments were concerned with the practical side of things and were both willing and anxious to leave science to the control of an independent body.

Today, the importance of science is recognized and a steadily increasing number of scientists are employed by governments. As a result the national academies have to a considerable extent lost their position as authoritative government advisory bodies. This is, I think, inevitable since if science is important to government it is natural that the governments should set up their own scientific organizations and use their own consultants. In a sense, therefore, the position of the Royal Society of London is an anachronism. Even with it, however, there has been a gradual loss of authority, and the National Physical Laboratory, for example, is now in reality under the control of the Department of Scientific and Industrial Research.

It should, however, be appreciated that there is a great deal of difference between power and influence. There is no question that the power of the Royal Society of London has greatly diminished. On the other hand it has to a large extent maintained its influence. This is due to several factors. It tries to select the best people and maintains its outlook as a working society, not merely as an academy to which it is an honour to belong. It has concentrated on doing a job, and not on insistence on its prestige. And finally it has shown an ability to move with the times by, for example, recognizing the need for having leading industrial scientists among its members.

The trend towards science in government appears to be inevitable so long as it is considered that science is of importance to the community. This trend is, I think, entirely reasonable. It is obvious that if large amounts of money are necessary for the support of science they will not be given without as least some curiosity on the part of government as to how the money is used. It seems to me that no national academy which maintains its independence can regard itself as a government adviser by divine right. The main point I should like to make is that there has been a drastic and inevitable change in the relation of the national academy to society and to the government as far as science is concerned.

Before discussing opportunities for useful work by a national academy, I should like to summarize a few trends which seem to me to be dangerous at the present moment. The first of these is the attempt to "plan" the effort in pure science. This largely stems from a confusion of the aims of science and technology. One must admit that this confusion is to some extent the fault of scientists who encourage it in attempts to get financial support for fundamental work. It is perhaps not unfair to say that some scholars in the field of the social sciences and even in the humanities have also encouraged such confusion under similar circumstances.

On this subject I would like to quote some remarks by Polanyi:[2]

> The popular scientific books which I used to read as a child were mainly concerned with displaying the wonders of nature and the glorious achievements of science. They dwelt on the enormous distances between the stars and on the laws governing their motion; on the crowd of living creatures made

[2]M. Polanyi, *The Planning of Science*, Society for Freedom in Science, Occasional Pamphlet no. 4 (Oxford, 1946).

visible in a drop of water under the microscope. Among the best sellers of the time was Darwin's *Origin of Species* and every new discovery throwing light on the process of evolution aroused intense general attention. Such were the topics and interests that came first to mind in connection with science even twenty years ago.

It was not forgotten, of course, even at that time that science also provides a store of most useful knowledge; but this was not considered as its principal justification. New practical inventions like the electromotor or the wireless telegraph were thought to be merely occasional offshoots of advancing scientific knowledge.

Today boys and girls who are interested in science are given a very different idea of it. They read books which profess that the primary function of science is to promote human welfare. . . . All these books emphatically oppose the view, generally accepted before, that science should be pursued for the sake of enlightenment regardless of its practical use. They have exercised a powerful popular influence which has been consolidated lately by the support of important organizations. . . . [The older] conception of science is still generally maintained by the academic profession; but it is no exaggeration to say that it is already beginning to be forgotten by the broader public, even though it was universally accepted by it only fifteen years before.

At first sight these remarks might appear to be incompatible with those of Conant, cited before, but this is not so. What is really implied is that fifty years ago it was important to overcome academic snobbishness towards the practical man. Today, on the other hand, the confusion of science with technology glorifies the scientist, but imperils the whole foundation of the scientific structure.

Another trend which arises from the same factors is the decline of scientific societies. At first sight this decline is by no means apparent. Societies are increasing in number, and their membership is expanding beyond all bounds, in one case to over seventy thousand. However, the increasing industrialization has brought about a very great change in the type of membership. The majority of the members are apt to have no real interest in the advance of science. The societies tend to be professional bodies, and the meetings more and more to resemble the normal type of convention. The welfare of science itself, rather than that of scientists, seems therefore to be in the process of being handed back to bodies of the national academy type. There is no question that there will be an increasing opportunity for accomplishment in this field.

Another modern feature has been the change in the type of support for scientific research in universities. Scientific research has become more expensive so that increased support is needed. This change has occurred, however, at a time of high taxation. As a result endowment has become relatively less significant and universities have become more and more dependent on *current* support. This raises many problems. The best summing-up of the situation is the well-known remark that Stephen Leacock once made in an address at McGill. He declared that "the most glorious thing about James McGill is that he is dead," and went on to develop the argument that "the only good benefactor is a dead one." There is no ques-

tion that endowment means, ultimately at least, that the funds are free from control, while the live benefactor, be he an individual, a corporation, or a government, is always just around the corner. The problem of academic support without interference has always been a serious one, and it will certainly become increasingly so.

Another feature of the present day, referred to above, is the problem of secrecy, and the attendant destruction of internationalism in science. This has been talked about so much that I do not want to enlarge upon it here. It is, however, worth mentioning once more its importance and the necessity of keeping alive the view that security regulations are intrinsically objectionable even if necessary in the disturbed conditions in which we live. It is worth emphasizing that the free exchange of scientific information has been a very recent development. Even in the eighteenth century travel was slow and difficult and the delivery of letters was uncertain. The exchange of scientific thought and of experimental results was mainly carried on by the writing of books and by personal correspondence. It was not, however, unusual for information to take ten or twenty years to get from one country to another. This had the very unfortunate effect of encouraging the tendency to develop local "schools" of thought, and to substitute authoritarianism for objective thinking. The important thing to note is that this kind of situation prevailed not so long ago. We have in fact only cultivated the outward appearance of objectivity for a century or two. The lesson is, I think, that it was societies like the Royal Society of London that initiated the developments which led to the free exchange of ideas, and it is certainly their responsibility to fight for its maintenance.

In passing I should like to mention the large amount of loose thinking which is prevalent on the moral obligation of scientists to prevent the misuse of science. Science merely furnishes the knowledge. This can and will be put to whatever use the society of the day dictates. The moral obligation of the scientist is thus no more, and no less, than that of any other member of society. Further, one cannot develop science piecemeal, and a return to seventeenth-century weapons means a return to seventeenth-century public health.

To sum up, recent developments in the relation of science to society have certainly diminished the real or potential power of the national academy as far as science is concerned. It seems to me, however, that if such a society can become a real working group, rather than a congenial club of scholars with distinguished pasts, there is still much to be done. The upholding of the freedom of science, of the university, and of the scientist seems to be one of the main problems with which the society might concern itself. Much can, I think, be done, provided that vague, high-sounding objectives are ignored, and attention is paid to real problems open to attack.

Finally, I think it is important to consider why the things which worried Dr. Bruchési in his address last year are so different from those which I have discussed this year. Our society includes the humanities, the social sciences,

and the natural sciences. In the case of the natural sciences, there is no lack of popular recognition of their importance, and there is very considerable financial support. The main danger is not lack of recognition but rather that recognition based on misunderstanding may destroy the whole structure of scientific freedom. In the case of the humanities, however, the main difficulty is the lack of recognition and support. The social sciences appear to be in an intermediate position, and will soon begin to find that increased support brings with it increasing interference. The possibilities for useful activity by the Society are thus quite different in the three cases. I think that there is much that is worth doing by the Society but it is essential that the different groups should realize the quite different nature of the problems in their fields.

APPENDIX B

BIOGRAPHICAL SKETCHES OF DECEASED MEMBERS

John A. Allan

1884–1955

JOHN A. ALLAN, Professor Emeritus and former head of the Department of Geology at the University of Alberta, died suddenly at his home in Edmonton on Monday, May 23, 1955. He was seventy years of age. He had suffered from a heart condition for several years, but the end came suddenly. He is survived by his widow and two sons, Dr. J. Donald Allan and Edward J. Allan, both of Edmonton.

Dr. Allan, who retired from formal duties five years ago, was Professor of Geology at the University of Alberta for nearly forty years. He initiated the teaching of the subject of geology and was one of the early group of men responsible for laying the foundation for instruction in the University in its earliest days. He was an excellent lecturer and managed to impart a good share of his enthusiasm for his subject to his students. He believed that a department of geology should have a museum as a nucleus, and the excellent museum housed in the Department of Geology at the present time is a fitting memorial to Dr. Allan's initiative and enthusiasm.

John Allan was born at Aubrey, Quebec, in 1884. He studied at McGill University and received the degrees of B.A. and M.Sc. in 1907 and 1908. He took advanced studies in Geology at Massachusetts Institute of Technology, obtaining his doctorate degree in 1912. His early work was with the Geological Survey of Canada but, on obtaining his doctorate degree, he was appointed to the Department of Geology, University of Alberta.

In his early years, Dr. Allan's chief study was the Rocky Mountains, especially the igneous intrusion on Ice River near the town of Field, B.C. The study of this intrusion was the subject of his thesis for his doctorate degree. It was published by the Geological Survey of Canada as Memoir 55, and became internationally known. In recognition of his work in the Rockies a mountain in the Banff area was named for him.

Dr. Allan was active in scientific organizations and loved attending the meetings and associating with his fellow-men. He was a Fellow of the Royal Society of Canada and was President of Section IV in 1935. He was a past president of the Canadian Institute of Mining and Metallurgy, a member of the Engineering Institute of Canada and the Association of Professional Engineers of Alberta. He served as President of the latter organization in 1930. He was a Fellow of the Geological Society of America, the Society of Economic Geologists, and the American Association of Petroleum Geologists.

Dr. Allan had an important part in the founding of the Research Council of Alberta and served as Director of the Section of Geology until his retirement from the University. During this period, from 1920 to his retirement, he issued yearly reports on some economic field pertaining to the geology of Alberta. His principal study was coal and he and his assistants investigated

the various coal areas with increasing enthusiasm. The reports are of high quality and provide his greatest scientific contribution to his adopted province.

Among his many fine qualities, Dr. Allan will always be remembered by his friends for his tremendous enthusiasm in any work he undertook. This was especially notable in his attempt to promote the exploitation of the mineral resources of Alberta. He never lost faith in the idea that there were vast oil resources in Alberta and he was entirely justified in that faith. He liked organizations, and joined many. He gave unstintingly of his time and strength in promoting the objectives for which they stood.

In spite of his busy life, Dr. Allan was a strong family man. His greatest enjoyment was a quiet evening at home surrounded by his family and friends. This is the picture that will always remain with those who were his close associates.

P. S. WARREN

JOHN A. ALLAN

Robert William Boyle

1883–1955

THE sudden passing of Dr. R. W. Boyle in London, England, on April 18, at the age of 71, has removed one of the last of that small band of pioneers who were responsible for establishing in Canada the importance of research during the early years of the present century. Born in Carbonear, Newfoundland, on October 2, 1883, the son of Albert D. Boyle, M.D., and Sophie Madelock Boyle, he received his early education there and at St. John's College. On graduation from this Methodist college, he was awarded the Newfoundland Jubilee Scholarship with which he entered the engineering faculty of his father's Alma Mater, McGill University, taking the course in electrical engineering. His academic record was a brilliant one and on graduating in 1905 he received the Scott prize, the General Electric Scholarship, the British Association prize and the British Association Medal. During his undergraduate course he became especially interested in physics, as a result, according to Dr. A. Norman Shaw, of the stimulating lectures of Professor Cox and the brilliant research activity of Rutherford with his distinguished group of associates, who had made the Macdonald Physics Laboratory famous as a centre of investigation in the field of radioactivity.

On graduation Boyle was appointed a demonstrator in Physics and also gave some lectures in Mathematics, which enabled him to enter with enthusiasm the group working under Rutherford. His investigations into the properties of the emanations of radium and thorium were thorough and are recorded in Rutherford's *Radioactivity*; for these he received in 1909 the first Ph.D. granted by McGill University. The same year he was chosen an 1851 Exhibition scholar; he proceeded to Manchester and there continued his work on radon and thoron. It must have been a great experience for, at that time, Rutherford had a number of young graduates working with him who have since become famous—Mosley, Geiger, Bohr, Marsden, Darwin, Chadwick, and others.

In 1911 he returned to McGill to teach Physics and Mathematics but in 1912 on the establishment of the University of Alberta, Dr. H. M. Tory, the President, invited him to become Head of the Department of Physics at the new provincial university. With his drive and enthusiasm, he established an excellent department there, both for instruction and for the emphasis on research.

Soon after the outbreak of the First World War, he joined the staff of the Board of Invention and Research, later known as the Anti-Submarine Division of the Admiralty. In 1916 he was placed in charge of the work on submarine detection by echo methods using high frequency sound waves. The ultrasonics were produced by oscillations of quartz crystals due to their piezoelectric properties. This was a very difficult investigation at a time when electronic amplifiers were not yet available. When the simple

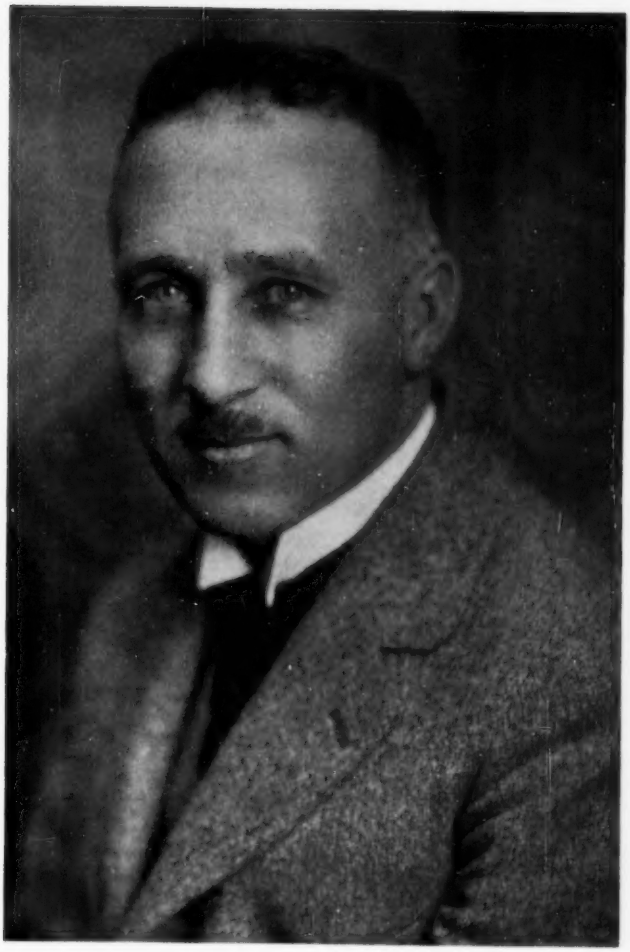
triode tubes were eventually obtained from France in 1917 he established by his drive and vision the success of what later became known as "Asdics." By the end of the war he was obtaining echo ranges of 1,400 yards with good bearing. The credit for developing asdics belongs to Boyle and the enormous further development in its application during the Second World War arose from the original work at Parkeston Quay, performed without the assistance of modern electronics.

On returning to Alberta in 1919 he continued research on ultrasonics with a small band of enthusiastic research students, making numerous fundamental measurements in this field; the work is referred to in the *Encyclopaedia Britannica*, the *Dictionary of Applied Physics*, and advanced text-books on sound and piezoelectricity. His appointment as Dean of the Faculty of Applied Science in 1921 extended his influence on research to other fields and created in western Canada an oasis of scientific interest in original investigation that has continued ever since.

When the National Research Council Laboratories were established in Ottawa, a Director with energy and vision was required for the Division of Physics and Electrical Engineering and Boyle was appointed to fill this new post in 1929, which position he occupied until his retirement in 1948. During this period his division made notable contributions to Canadian industry and during the Second World War especially was responsible for the major development in radar and various other devices which the Council contributed to the war effort. Though his plans for expansion in research were curtailed in the thirties by the depression which followed the boom of the late twenties, he could look back on his period of service at the Council, on his retirement in 1948, with the knowledge that the foundation which he laid formed a sound basis for the great development which both the Physics and Electrical Engineering Divisions have since achieved.

Affectionately called "Billy" by his many friends in various parts of the world, he was a popular member at any gathering of men or ladies. He was a lovable character, an interesting and vivid conversationalist, and a kind, loyal friend to all his colleagues. Travel and fishing were his particular hobbies, and following his retirement he visited many continents, never failing to send cards at Christmas to his old friends, whether he was in South America, Europe, or Africa. We, who knew him for many years, looked forward to his periodic return to Canada from his travels, for we were assured of a most enjoyable evening hearing of his adventures in picturesque and lively descriptions of places and people he saw and met. He will be greatly missed by his many friends both in Canada and abroad, for he was a well-known international figure.

He received many honours. Elected to the Royal Society of Canada in 1921, he was President of Section III, 1924–5, received the Flavelle Medal in 1940, and was honored with an LL.D. by the University of Alberta in 1933. He was a fellow of the American Physical Society, the Acoustical Society, and a member of numerous engineering societies. He is survived



Robert William Boyle

by two sisters, Mrs. Mary E. Watts and Mrs. Margaret B. Horton of Billerica, Mass., and three brothers, Dr. Hubert Boyle, M.D., of New Bedford, Mass., George Boyle of Grand Falls, Newfoundland, and Albert S. Boyle of Edmonton. He never married. His funeral services were held at Golders Green Crematorium and his ashes were buried in Woodlawn Cemetery, Everett, Mass., beside the graves of his father and mother.

DAVID A. KEYS

Milton Alexander Buchanan*

1878–1952

IN the death of Milton Alexander Buchanan on May 7, 1952, Canada lost not only her only Hispanist with an international reputation, but one of her very few scholars in the whole modern language field who were known outside their national borders. Professor Buchanan was a native son of Ontario, having been born at Zurich, a small town near Lake Huron, on July 17, 1878, the son of Dr. George and Emma (Zeller) Buchanan. After attending high school in the neighbouring town of Goderich, he matriculated in the University of Toronto (University College), where he took the honour course in Modern Languages, graduating first place in First-Class Honours in 1901. He then obtained a Fellowship at the University of Chicago, where he came under the influence of Karl Pietsch, the noted Romance scholar, who initiated him into the severely scientific methods of modern literary scholarship which had their origin in Germany. The years 1902–4 were spent in Europe. In Paris, he studied under the well-known Romance philologists Gaston Paris and Morel-Fatio. It was on their advice that he decided to take as his special field the Spanish language and literature. He then proceeded to Madrid, where he worked with Menéndez Pidal and Menéndez y Pelayo, who steered him into what became his favourite preserve, the Spanish drama of the Golden Age. He returned to Chicago in 1904 as Assistant (later Associate) in the Department of Romance Languages. He took his Ph.D. there in 1906, publishing as his doctoral dissertation a critical edition of Mira de Amescua's play, *El Esclavo del demonio*. He immediately received a call to his own University of Toronto, where as lecturer first, then successively as Associate Professor (1910), Professor (1916), Head (1917) of the Department of Italian and Spanish, he remained till his retirement in 1946. Under Buchanan's administration Portuguese was added to the sheaf of Romance Languages taught by his Department. In 1913, he married Marie Avery of Galena, Illinois, who survives him. He was elected a member of the Royal Society of Canada in 1935.

I met Buchanan soon after his return to Toronto in 1906 (we received our appointments to the University at the same moment) and for more than a decade after that I saw a good deal of him. I recall vividly our walks and talks together and the zeal he displayed in those early years for research work and his contempt for the academic "dilettante." He used to try to persuade me—not with complete success—that the only kind of literary scholarship that had any serious validity was the strictly objective and impersonal type and that most literary criticism was nothing but impression-

*Owing to a regrettable oversight a Biographical Sketch of the late Professor Buchanan did not appear in the Proceedings of the Society for 1952.—EDITORIAL COMMITTEE.

istic "dilettantism." But whether one agreed wholly with his ideas about the study of literature or not, one could only pay the highest tribute to his scientific probity as an investigator and to his courage and persistency as a man for the way he carried on his research for over forty years under the most tragic handicap that can be visited on a literary scholar—defective eyesight. He suffered from this disability from boyhood so severely that he was never able to use his eyes for reading or writing by artificial light.

What he managed to accomplish in the way of productive work under these limiting circumstances is truly remarkable, as may be seen by a glance at the bibliography of his publications drawn up by Mr. Jack H. Parker, his student and colleague, with the aid of Mrs. Buchanan (reprinted in pamphlet form from the *Hispanic Review*, vol. XX, no. 4, October 1952). It fills nearly seven pages, extending from 1904 to 1952. Hardly a year goes by without an article or a review (usually several) from Buchanan's pen in such periodicals as *Modern Language Notes*, *Modern Philology*, *Modern Language Review*, *Romanic Review*, *Revue Hispanique*, *Transactions of the Royal Society of Canada*, etc. It was a particular compliment to Buchanan that, early in his career as a scholar, he was invited to write the yearly reviews of recent studies in Spanish literature for Vollmöller's *Kritischer Jahresbericht über die Fortschritte der romanischen Philologie* (1908–14). Among his works of larger scope may be mentioned his editions of Calderón's *La Vida es Sueño* and of Lope de Vega's *Amar sin saber á quién* (co-editor Bernard Fransen-Swedelius), his *Graded Spanish Word Book*, his *Annotated Bibliography of Modern Language Methodology* (co-author, E. D. MacPhee), his *Spanish Poetry of the Golden Age* (an anthology with introduction and notes: two editions). Retirement did not diminish his ardour for research. In his last years, he opened up a new field, the investigation of early American and Canadian history in the days of the great explorers from the vantage-point of a scholar well versed in the background of Spanish and Portuguese history and philology, with particular reference to the clearing up of the origins of place-names in north-eastern America. The malady which carried him off found him engrossed in these new studies and he often expressed the wish that some younger scholar might be found to take up the task where he was forced to leave off. His last writing was the charming tribute to a fellow-Hispanist, Aubrey F. G. Bell, which appeared in *Portugal and Brazil: An Introduction*, ed. H. V. Livermore and W. J. Entwistle, and which makes one wish that Buchanan had written oftener in this more relaxed and personal style.

Buchanan's great hobby was book-collecting. He amassed a valuable collection of Italian, Spanish, and Portuguese books which he donated to the University of Toronto Library in his will.

An account of Buchanan's life would be incomplete without a reference to certain executive functions which he exercised and which were evidence of the high esteem in which he was held by his colleagues in the United States. When an American Committee to investigate the teaching of mod-

MILTON ALEXANDER BUCHANAN

ern languages in the United States was formed in 1924, it invited Buchanan to form a corresponding Canadian Committee, of which he was in due course elected Chairman. The onerous duties which thereby devolved on him for the next few years may be gauged by a glance at the two massive volumes, *Modern Language Instruction in Canada*, which the Committee published in 1928 as its report. Again, on the death of President C. C. Marden of the Modern Language Association on May 12, 1932, Buchanan was elected to fill the Presidency as his successor (the only Canadian to occupy that position) and he delivered the presidential address on the topic: "Calderón's Life is a Dream" at the annual meeting of the Association in New Haven, Conn., on December 29, 1932.

Perhaps, after this brief sketch of his life, it may be agreed that Buchanan never uttered a more characteristic remark than when, on learning how seriously ill he was, he said that, unless he could be strong enough to continue his work, he would rather not recover at all.

A. F. B. Clark

Clive Elmore Cairnes

1893–1954

DR. Clive Elmore Cairnes, formerly of the Geological Survey of Canada, died in Vancouver on August 15, 1954. He was a resident of Ottawa, at 255 First Avenue, and was visiting relatives and friends in Vancouver for the summer, following his retirement from the Geological Survey in June, 1953.

Dr. Cairnes was born in Stratford, Ontario, on June 18, 1893. His family moved to Saskatoon shortly after his birth, and from there to Vancouver in 1903. It was in Vancouver that he received most of his public school and all his high school education and went on to obtain his B.A. in 1916 from the University of British Columbia. The following year he gained a B.Sc. degree from the University of Washington at Seattle and thereupon joined the armed forces, with which he served until 1919. While still in his early teens he spent his summers with his brother, Dr. D. D. Cairnes of the Geological Survey, in the Yukon Territory and northern British Columbia. It was in these years that he developed his interest in geology and Mount Clive, west of Tagish Lake, was named for him.

In 1918 and 1919 he was on special service studying the salts of the Dead Sea in Palestine with the late R. W. Brock, former Director of the Geological Survey of Canada. After the war he continued his studies at Princeton University where he received his A.M. degree in 1921 and his Ph.D. in 1922.

In 1922 he joined the staff of the Geological Survey, having previously served two summers as a student assistant. Until 1937 he was active in the field, but in the following winter he suffered a heart attack which made further field work impossible. His activities being thus restricted to the office, he undertook the technical editing of all geological maps and reports published by the Geological Survey and continued this work until his retirement.

The field of his research was largely in southern British Columbia. Reports based on his studies stand as models of painstaking thoroughness, and exemplify the keenness of observation and careful attention to detail that must be the basis of all sound scientific work. His memoirs on the Coquihalla, Slocan, Bridge River, for instance, are classics. He was in all things conscientious to a fault and at the same time most considerate of his field assistants.

Over and above his scientific work Dr. Cairnes was an outstanding ambassador for the Geological Survey, giving his time and effort ungrudgingly to all with whom he came in contact, whether high-ranking mine official or casual prospector. Anyone who has visited areas in which he worked can testify to the high regard in which he was held by the local inhabitants and

has heard enthusiastic tributes to help and encouragement that he unsparingly and patiently gave.

He was held in the same high regard by his colleagues on the Geological Survey. His editing of maps and reports, like his field work, was painstakingly thorough and the high quality of Geological Survey publications is, in great measure, due to his efforts. In spite of the many discussions, indeed arguments, that arose as a result of his criticism, Dr. Cairnes's warm-hearted friendship and tact won for him nothing but appreciation and a respect for his judgment; the selflessness of his efforts was apparent at all times.

Dr. Cairnes was made a fellow of the Royal Society of Canada in 1930. He was a member of the Canadian Institute of Mining and Metallurgy and a member of the Society of Economic Geologists. He was the author of four memoirs for the Geological Survey and many geological maps and papers published by the Geological Survey or by professional journals. Much of his writing after 1937 was, however, in the course of his editorial work and was in reports with which his name was never associated. During his time as Technical Editor some 85 Memoirs and Bulletins and over 370 Papers by officers of the Geological Survey passed through his hands, all of which were to a greater or less extent the fruit of his efforts.

His conscientious attention to his duties left him little time for outside activities, but he was always a great reader and his library was well stocked with books on travel, biographies, and lighter works of historical fiction. He was also a keen follower of sports of all kinds and was commonly seen at baseball and football games. Indeed his visit to the West was at least in part to attend the British Empire Games in Vancouver.

Besides his wife, the former Adeline R. Whitmarsh of Ottawa, he leaves a sister in Vancouver, Mrs. A. E. Lovitt. His elder brother, the late Dr. D. D. Cairnes, was a member of the staff of the Geological Survey and well known for his work in northern British Columbia and the Yukon. The funeral ceremony was held in Vancouver and interment was in Ocean View Cemetery, Vancouver, B.C.

H. M. A. Rice

CLIVE ELMORE CAIRNES

John William Campbell

1889–1955

HIS many friends will learn with deep regret of the death of Dr. John William Campbell, Emeritus Professor of Mathematics at the University of Alberta, on January 23, 1955, at the age of 65.

Dr. Campbell was born on an Ontario farm in 1889, in Scotch Block, an agricultural and lumbering community. After attending high school he taught for a while in a country school and studied extra-murally, finally entering Queen's University. Here he took his M.A. in 1913, and went on to Chicago, where he worked under Professor Moulton, the well-known astronomer. He obtained his Ph.D. in 1915 for a thesis on the problem of three bodies; thus began a life-long interest in the teaching and practice of astronomy. After brief periods of lecturing at Wesley College and at the University of Iowa, and after a period of war service (1917–19) in the Royal Garrison Artillery, Dr. Campbell returned in 1920 to the University of Alberta, where he remained until his retirement in September, 1954. For the last seven years he had been Head of the Department of Mathematics.

Besides teaching courses in Astronomy for over thirty years, Dr. Campbell was instrumental in founding the Edmonton Centre of the Royal Astronomical Society of Canada, and as its Honorary President, to which position he was automatically elected every year, he gave unstintingly of his time and energy to the Society. He persuaded the University to construct and maintain a small building and dome to house a 12½ inch reflecting telescope which was presented to the University by an enthusiastic amateur astronomer, the late Mr. C. G. Wates. Dr. Campbell never wearied of showing visitors, both young and old, the beauties of the night sky as revealed by this telescope, and he maintained popular interest in astronomy throughout the Edmonton district by a series of weekly articles contributed to the local press. Dr. Campbell spent two summers working at the Dominion Astrophysical Observatory in Victoria, and thus gained practical experience in observational and computational astronomy. He served as President of the Astronomical Society of Canada in 1947 and 1948, contributing presidential addresses on rocket flight and on the origin of the universe. His keen sense of the mechanical difficulties which need to be overcome before guided space-travel is practicable led him consistently to pour cold water on what he considered the undue optimism of space-travel enthusiasts.

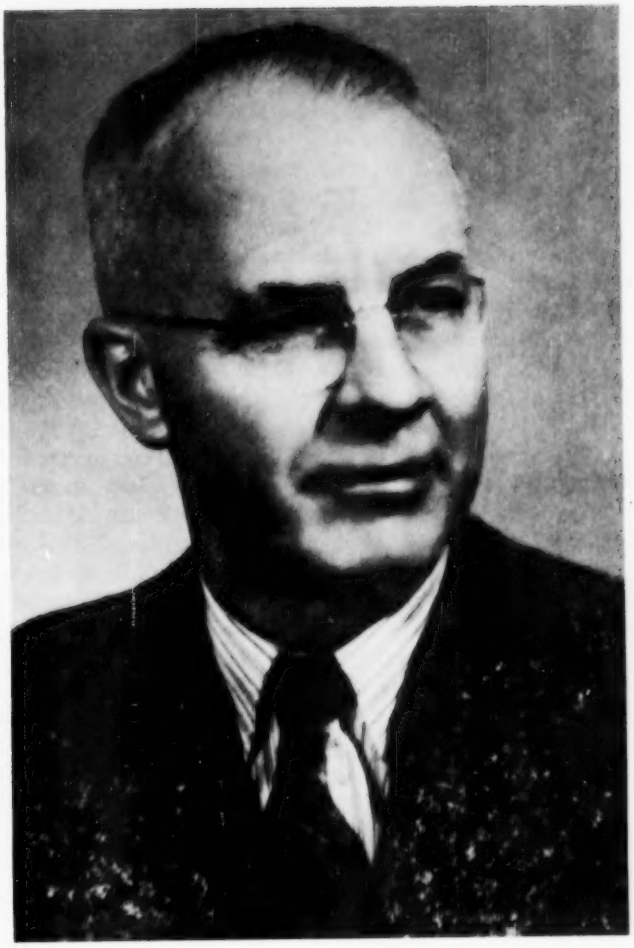
In the field of applied mathematics, Dr. Campbell contributed a number of papers on relativity problems and on the equilibrium of flexible cables under varying conditions of load and temperature. His four-figure mathematical tables of the hyperbolic functions and his manual of catenary calculations have proved of great practical value to engineers working in this

field. The elementary text-book, *An Introduction to Mechanics*, has appeared in several editions and is quite widely used throughout North America. It is a careful and conscientious treatment of the basic principles, with emphasis on the importance of units and of numerical calculations, but understandably with somewhat undue space allotted to the catenary. Dr. Campbell was elected a Fellow of the Royal Society of Canada, Section III, in 1936, and attended the meetings with considerable regularity.

Until the last few years of his life, when he suffered from Parkinson's disease, Dr. Campbell was active in sport. He was a keen tennis and badminton player, loved the mountains, and was never happier than when travelling across the country in his car. He fought a hard but losing battle in many a committee and faculty meeting against the decline of mathematical standards in our schools. Always a sympathetic and helpful colleague and department head, he possessed a great fund of anecdotes, which, in his characteristic slow and hesitating way, he told with keen enjoyment.

He is survived by his wife Ruby (herself a Queen's graduate), a son Donald and a daughter Elizabeth.

E. S. KEEPING



John William Campbell

Joseph John de Gryse

1885–1955

MR. J. J. DE GRYSE died on April 29, 1955, in his 70th year at his country residence at Corkery, Ontario, almost three years after his retirement from the Canadian Department of Agriculture. His death from a heart attack came as a great shock to his family, professional associates, and friends.

Mr. de Gryse was born on May 11, 1885, at Roulers, Belgium, and graduated from the University of Louvain. He emigrated to the United States and worked for a time in Virginia and at Washington with the United States Department of Agriculture, before coming to Canada in 1923. He was first appointed to Indian Head, Saskatchewan, and was transferred to Ottawa two years later. In 1934, he took charge of forest insect investigations throughout Canada and in 1951 became Chief of the newly created Forest Biology Division.

Although his duties were largely administrative in the last twenty years, he was a brilliant scientist in the true sense of the word. In his early years, he specialized in the morphology of lepidopterous larvae. His numerous contributions to various scientific journals, including the *Transactions* of the Royal Society of Canada, were characterized not only by technical brilliance but by a superb mastery of English. He was also fluent in French, German, and Dutch, not to mention Latin, Greek, and a working knowledge of Spanish and Italian. He had a special flair for organization and clear concepts for development of research. He brought a keen scientific mind to bear on the co-ordination and integration of forest biology in relation to the requirements of forestry and forest conservation throughout Canada. Organization of the Canadian Forest Insect Survey, development of research on forest insect diseases, and many original ideas in these fields are directly attributable to his scientific brilliance.

Scientists throughout Canada will regret the passing of Mr. de Gryse, biologist, artist, philosopher, and above all a gentleman and true friend.

D. E. GRAY and E. B. WATSON

Joseph John de Gryse

John Alexander Dresser

1866–1954

JOHN ALEXANDER DRESSER died at Westmount, Quebec, July 5, 1954, in his 89th year, after a career as teacher, petrographer, field geologist, consulting geologist, and administrator. He was born in the Eastern Townships of Quebec at the town of Richmond, June 27, 1866. According to his story, his ancestors had been among those on the move from New England after the American Revolution and had settled near Richmond in the belief that it was territory of the United States. The settlers later became loyal citizens of Canada. Affection for and interest in the townships and its people were among Dresser's outstanding characteristics.

His primary education was at Richmond, and he completed a part of his secondary education at St. Francis College there. He obtained the B.A. degree from McGill University in 1893. Then followed some post-graduate work at Harvard, part of which was a summer session—he used to insist on the superiority of a summer session over a winter session as exemplified by his experiences at Harvard. He obtained an M.A. degree in geology in 1897 at McGill University, which in 1933 awarded him an LL.D. degree in recognition of his contributions to geology and the University.

Like many other geology graduates of his time, Dresser became interested in petrography, and his earlier work was largely based on the examination of thin sections. His first paper, published in 1896, is on the petrography of some rocks from the Laurentian region north of Hull. Several Geological Survey of Canada reports give descriptions by him of thin sections collected by other geologists, although he was engaged in teaching at the time. His interest in geology broadened and he undertook field work particularly in his beloved Eastern Townships.

Dresser was much interested in teaching: he was principal of St. Francis College in his native town from 1895 until 1903. He gave lectures in the Agricultural College at Compton in 1902 and 1903. He was Lecturer in Geology at McGill University in the sessions 1907–9. His lectures were concerned with petrography and ore deposits. During the two decades after he left the University, he was a frequent guest lecturer to the advanced students. Many years later he related with glee the iconoclastic views he presented to the students. From 1929 to 1939, he organized and directed a journal club with monthly meetings in Quebec City for the local geologists.

His interest in teaching brings out another facet of his character. He was very interested in the young. He gave his advice freely. Many years later he was still interested in the young people he had perhaps started on a career in the mineral industry and was always anxious for news of them.

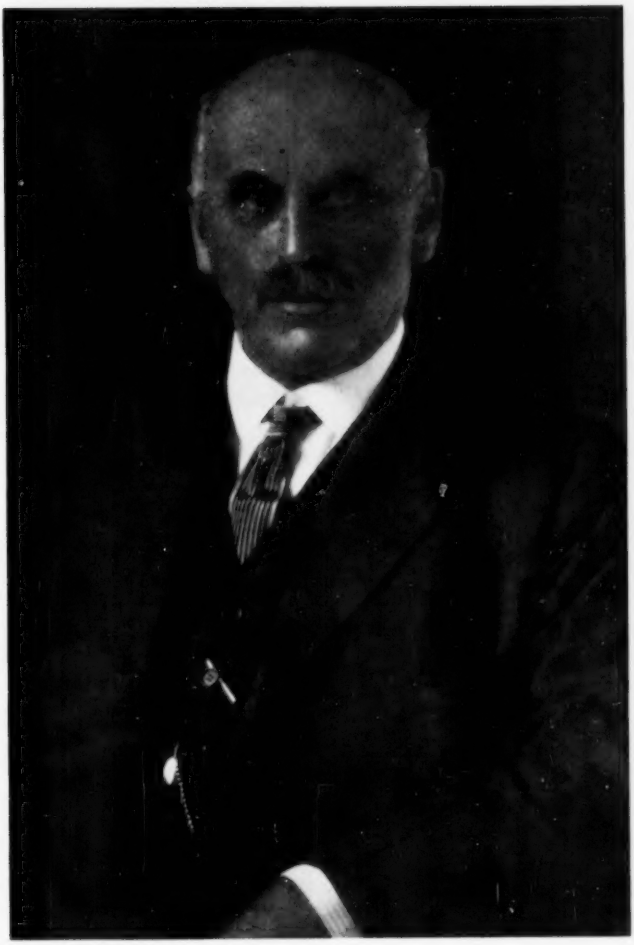
During the time he was teaching, geology was getting a greater share of his interest. The field work he carried on in the vacations and the labora-

tory work in petrography became more absorbing. He had tenuous connections with the Geological Survey of Canada from 1897 onward. He did much work on Brome, Shefford, and St. Bruno mountains, some of the so-called Monteregian hills. He examined the copper and chromite deposits of the Eastern Townships and described and discussed the origin of the asbestos deposits. He became interested in the intricate relationships of the Palaeozoic rocks, and he devoted much thought and work to establishing their positions. Some of his inferences have become an integral part of the geological knowledge of the Appalachian belt. From 1909 to 1911, he was a full-time field officer for the Geological Survey. After his resignation in 1911, the director deplored the loss of his experience to the survey. In the summer of 1915, he was again employed by the Survey in an examination of the Precambrian and Palaeozoic rocks of the southern part of the basin of Lake St. John. Most of his field work, however, was in the Appalachian region, and his thoughts returned there until the end of his life. He enjoyed going back for field trips despite the fact that obesity and asthma made it difficult for him to cross rough ground. It was a delight to accompany him; every landmark brought forth an anecdote concerning his own or another geologist's work. Items of interest about the inhabitants were numerous, particularly concerning horse-traders and their transactions.

From 1911 until 1915 he was Geologist and Manager of the Lands Department of the Superior Corporation with headquarters at Sault Ste Marie, Ontario. During this interval, he became interested in problems of land use and mineral deposits of northern Ontario. Later, he referred to this as one of the happiest periods of his life.

In 1915 Dresser entered the consulting field, and he continued this work until the end of his life. He should rank as a pioneer, for, although others were doing this kind of work, he not only reported on metals both in lode and placer deposits and on mineral fuels but also on industrial and non-metallic minerals. He undertook work on engineering geology projects, such as dam-sites. He said with pride that he had the most general if not lucrative practice of any geological consultant in Canada. From 1922 to 1932 he was Geologist, Department of Development, Canadian Pacific Railway Company. His work took him across Canada appraising economic possibilities. He was always alert to note matters of scientific interest. I met him first in 1925 when he called at the office of the Geological Survey in Vancouver to point out an occurrence of gypsum in the Mesozoic rocks of British Columbia.

From 1927 to 1939 he was Directing Geologist, Division of Geology, Quebec Bureau of Mines. Previous to 1927, the Bureau of Mines had produced some geological reports, but the expanding mining economy made more geological work necessary and desirable. It was Dresser's task to organize the work. He chose areas to be mapped, mining properties to be studied, and special resources to be reported on. He edited all the reports, and what was probably most enjoyable to him, he interviewed all potential chiefs-of-



John Alexander Dresser

party and assistants. Before his retirement in 1939, he and his long-time friend, Dr. T. C. Denis, were made editors of the comprehensive *Geology of Quebec*. This consists of a bibliography and two thick volumes of text. The final volume was issued by the Department of Mines, Quebec, in 1950. Dresser edited and collated the work of the many contributors after his retirement.

He was the author of many papers on geology. Most of them pertain to the Eastern Townships; however, his interests went far beyond geology: the volume containing his first paper mentioned in an earlier paragraph has a paper by him on clouds. In addition to his contributions to Section IV of this Society, he presented a paper to Section II on population changes in the Eastern Townships.

He was a member of many scientific and other societies and had served as an officer in most. He was elected a fellow of the Royal Society in 1915 and served as president of Section IV in 1919–20. He was a member of the Canadian Institute of Mining and Metallurgy, and president in 1923–4. He was a fellow of the Geological Society of America, member of the Society of Economic Geologists, member of the Institution of Mining and Metallurgy, and member of the American Institute of Mining Engineers. In his later years, he often expressed regret at his inability to attend meetings of the various societies with which he was associated.

With such a rich and diverse career, it is necessary to search for the essential characteristics of the man. His interest in nature and particularly geology was easily seen, but more than that he was interested in people. His work after 1911 brought him into contact with many people, and this was a source of great satisfaction to him. His offices, first on St. James Street and later on St. Catherine Street in Montreal, were always open to visitors; he received many, and most were welcome. Honest and fair-minded himself, he would give a courteous reception to a visitor not having these qualities, but the visit would be brief. Pomposity and pretentiousness irked Dresser, and a visitor with these traits who stayed longer, would be a recipient of gentle fun. His wife, Elizabeth Lindsay, whom he married in 1911 and who died in 1934, shared his interest in people, making his home in Westmount a most enjoyable place to visit.

During the last few years of his life, he suffered several illnesses, which were largely the result of his venturing out in bad weather in order to go to his office to receive callers. His physician prescribed such massive doses of anti-biotics that he told Dresser that he survived only because he had a very strong heart. His friends and acquaintances can add that he had a great heart—a heart willing to embrace humanity.

F. Fitz Osborne

Donald Thomas Fraser

1888–1954

DONALD THOMAS FRASER died as he would have wished, suddenly, in Santiago, Chile, on July 19, 1954, while on a tour arranged by the World Health Organization through the Pan American Sanitary Bureau. He had planned to visit a number of universities in South America in order to learn the needs of the students for post-graduate studies, but had completed only a part of the tour.

Dr. Fraser was born September 27, 1888, in Toronto, Ontario, his father being the late Professor William H. Fraser, who for many years was Head of the Departments of Italian and Spanish in the University of Toronto. Professor Fraser is remembered by thousands of people as being the joint author with Professor J. Squair of an excellent French grammar and reader. Dr. Fraser's mother was Helene Zahn Fraser of Alsace and from her he derived many of his lovable qualities. He was the brother of the late Kaspar Fraser and of Professor Frieda Fraser of the University of Toronto. Dr. Fraser received his early education at St. Andrew's College and Harbord Collegiate Institute, Toronto. He entered the Natural Science course at the University of Toronto, and after graduating in Arts he continued his studies and obtained his degree in Medicine in 1915. Immediately following graduation he enlisted in the Canadian Army Medical Corps, transferred to the Royal Army Medical Corps, and served with the 94th Field Ambulance in Egypt until late in 1915. In the following year he was awarded the Military Cross for bravery at the Somme. Later he joined the British Expeditionary Force in China; for his service there he was mentioned in dispatches.

On his return to Canada, Dr. Fraser became a member of the Connaught Laboratories and shortly afterwards was appointed to the Department of Hygiene and Preventive Medicine, in the Faculty of Medicine of the University of Toronto, under the late Professor J. G. FitzGerald.

In 1919 he married Mary Shenstone. There are three children, Donald Fraser junior, Nancy Brooks, and Ian, and two foster children, daughters of a classmate Dr. Ray Hodge.

In the scientific field Dr. Fraser had a wide variety of interests. In the early days following the discovery of insulin, he was the first investigator to use mice in the assay of insulin and the first to publish work on this method of assay. In 1926 he, with Dr. G. D. Porter, wrote *The Canadian Health Book* for the Department of Education in Ontario. His great interest, however, was in immunology—mainly in the prevention of diphtheria. Of the forty-nine papers that he published in the period 1920–50, twenty-seven dealt with aspects of the subject. These included studies on transmission of the disease by carriers, types of organisms, measurement of immunity, the comparison of toxoids in the prevention of diphtheria, the

duration of immunity, and the importance of the recall dose in prolonging immunity. Canada's achievement in the prevention of diphtheria is one of the outstanding chapters in the history of public health and Dr. Fraser was one of the leaders in this field of endeavour. He was also interested in other fields of immunity and bacteriology including tetanus, scarlet fever, and whooping cough. Bacteriology and immunology were ever fruitful fields of investigation for his inquiring mind.

As Professor of Hygiene and Preventive Medicine he had a keen interest in teaching methods and he developed, in great part, the courses of instruction which are at present in use in the University of Toronto in Preventive Medicine; these extend over the four years of undergraduate training. In this field he was internationally known and his friends included leaders in preventive medicine and immunology in all parts of the world. He was president of the American Association of Immunologists in 1938–9, and of the American Epidemiological Society in 1948. He served on a number of committees of the American Public Health Association, including the Lasker Awards Committee, the Committee on Research and Standards, and the Subcommittee on the Control of Communicable Diseases. As a member of the latter committee, Dr. Fraser took an active part in the development and publication of the manual *The Control of Communicable Diseases in Man*, and its various revisions. He was elected a Fellow of the Royal Society of Canada in 1934, and was a senior member of the Canadian Public Health Association.

Dr. Fraser was not ambitious for himself. To him scientific research was an adventure and one that could be pleasantly undertaken only in an atmosphere of freedom and leisure. The tyranny and oppression which afflicted scientific workers in Germany from 1933 were extremely repugnant to Donald Fraser's generous nature. There was an almost unconscious liberalism of outlook which made him resent the absence of mental freedom for others just as much as for himself. He was therefore an active and helpful person in getting support for refugee scientists, and none of these ever turned to him in vain for assistance if there was anything that he could do for them either in his own department or in other departments in the University. His interest in them did not end with securing them a position but continued in a concern with their general well-being in their new surroundings. I have known him to spend days in trying to help a refugee scientist write a scientific paper for an English journal. In his own research he was ever ready to serve as an experimental subject. I doubt whether any man ever had blood drawn from his veins more often than had Dr. Fraser. Very often he took his own and did it with great dexterity. I also wonder whether anyone took more injections of different toxoids and vaccines. His own children were probably the first in North America to be immunized with diphtheria and tetanus toxoids.

Vigorous activity in sports was essential to Donald Fraser's life. In his earlier years he enjoyed and excelled in squash, tennis, canoeing, and bad-

DONALD THOMAS FRASER

minton. In later years, however, he had to content himself with skiing, walking in the mountains, and golf. In all his competitive sports his generous character showed clearly and his sterling qualities of true sportsmanship were always evident. It is perhaps fitting that he should have received his fatal heart attack on the golf course.

It has been said that a cultured man ought to know everything about something and something about everything, and few have approximated more nearly to that impossible standard than Donald Fraser. We have in his trip to South America unimpeachable evidence that he knew a great deal about preventive medicine and immunology. Specialists in many other fields have found that he knew a good deal about theirs as well. He not only painted well but had a keen appreciation of the work of others in the field of art. He played the piano and was also a regular attendant at the Symphony Orchestra concerts. His great love of nature was probably acquired in the summers spent at the family cottage at Go Home, Georgian Bay. He could identify birds by their songs and amazed one by his knowledge of flowering plants. He spoke French and German fluently and retained a good knowledge of Latin and Greek. His unfailing good nature and wide knowledge made "Ask Fraser" a solution to any baffling problem in our building in the University. He regulated his own life so well that he nearly always seemed to have plenty of time and energy for those who came to him for advice and inspiration. His judgments of other people's problems were level-headed, shrewd, and absolutely honest. His own serene philosophy of life kept him largely free from worry. Unlike the traditional Scot, he was entirely indifferent to money as such, either in the making or in the spending of it. Dr. Fraser changed little in the course of his life; he retained a freshness of mind and a sense of wonder. This was owing not only to his innate character, but also to his unique habit of work and play which endeared him to and inspired all who came in contact with him. His simplicity and his spontaneous friendliness made him always a welcome visitor even in scientific circles other than his own and he found himself completely at home in these. He loved his fellow men and women and children too, in all walks of life, and gave them of his best. Dr. Fraser was emphatically among those in Walt Whitman's words, "Whom fate never surprise nor death dismay."

D. A. Scott

Auckland Campbell Geddes

1879–1954

AUCKLAND CAMPBELL GEDDES, first Baron Geddes, a Fellow of the Royal Society of Canada, died on January 8, 1954. He was born on June 21, 1879, and educated at Edinburgh University where he obtained the degree of M.B.Ch.B. with honours in 1903.

This degree was followed by three years of post-graduate work at Edinburgh with Professor D. J. Cunningham, in London with Arthur (later Sir Arthur) Keith, in Freiburg, Paris, Berne, and Vienna. Then followed a trip to Canada and the United States to see their medical schools and hospitals. In 1906 he was appointed assistant to the Professor of Anatomy in the University of Edinburgh. Geddes was awarded the degree of M.D. and gold medal with honours from his University in 1908. In 1909 he was appointed Professor of Anatomy in the Royal College of Surgeons, Ireland. He accepted the Chair of Anatomy in McGill University in 1913. He left McGill on leave of absence to serve in various distinguished capacities in the First World War.

On the retirement of Sir William Peterson he was appointed Principal of McGill University, a position he held nominally for a year (1919–20). He was not in residence during that period.

During the period 1914 to 1920 Geddes held a number of important positions, at first military but from 1917 onwards as a Minister of the Crown in Great Britain. From 1920 to 1924 he was British Ambassador in Washington. When he retired from this post he was Chairman of the Royal Commission on Food Prices and then he entered the business field. He was Chairman of the Rio Tinto Company for twenty-two years and of the Rhokana Corporation from its inception. He was also a director of other companies.

In the Second World War he was from 1939 to 1941 Regional Commissioner for Civil Defence. In 1942 he was created a Baron.

What has been written above is the outline of the life of a great man. At the end of this article is appended a partial list of his papers.

To those who knew him he had the characteristics of greatness. John Connell in *Time and Tide* wrote the following: "In a lifetime one encounters, I suppose, half a dozen people who can be called great. Campbell Geddes was of that company." My own contact with him began at McGill when I heard him speak on the responsibility of the universities for the physical fitness of the students. At the outbreak of hostilities he commanded the McGill Contingent of the C.O.T.C. and his teaching and leadership will never be forgotten. I was fortunate in holding a commission in the battalion in which he was second in command and on manoeuvres it was quite obvious that he was an expert in tactics which involved a mastery of terrain and of human movement and reactions. After the war I was asso-

ciated with him in connection with the mining companies over which he presided in Spain and Northern Rhodesia. The qualities which impressed themselves on me were his insight into geological processes, his tremendous grasp of volume in relation to markets and dividends. He had an amazing photographic memory—a map, once seen, was photographed in the eye of his mind.

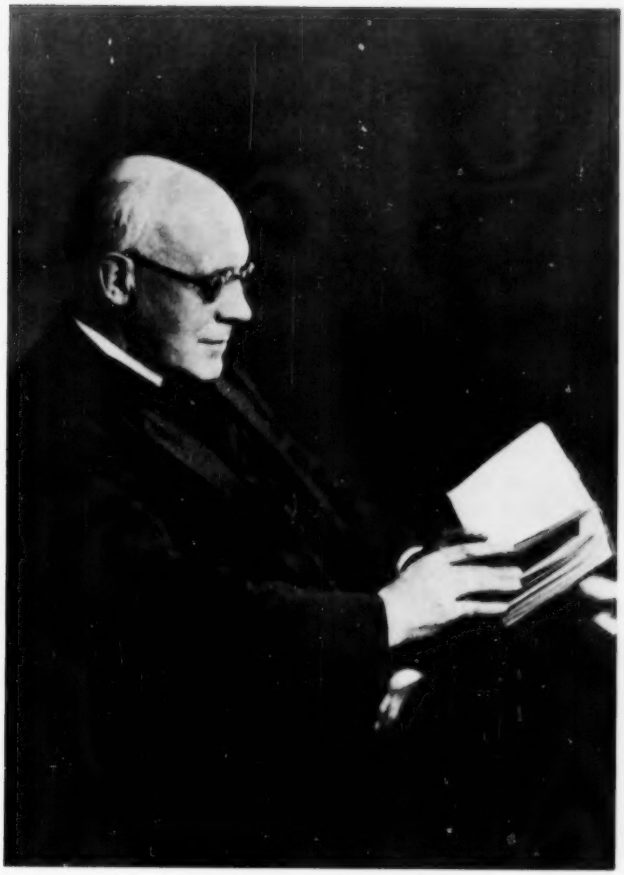
Geddes was a man of very strong opinions and he had a way of uttering these in a most forceful manner. If you disagreed with his views and were able to prove that he was in error you found that the "front" disappeared and that mutual understanding was increased.

During the years while I was connected with him in the role of geologist the contacts were chiefly professional. In 1947 he lost his sight and our relationship took an entirely different form. He would write frequently about his ideas on various matters and I would write to him about my thoughts. We carried on a long series of letters on Keith's ideas on Evolution. In 1951 I visited him at his home in Sussex, where he had moved in order that he could hear the sea. He spoke about his book *The Forging of a Family*, later to be published by Faber and Faber. Time and physical tribulation had developed a side of him which previously had not been observable though it must have been beneath the surface. I shall quote from his book: "On this earth, the brain of man alone of all that live has evolved as an end-organ of psychic apprehension sufficiently powerful to receive revelation, inspiration and comprehension of ethical values from the supernatural mind which is God, Supreme Evoker of Values."

In a letter to me dated January 14, 1953, in connection with our correspondence on evolution, Lord Geddes wrote the following:

> To those who, unlike the Chinese sages, believe that the existing physical universe is a creation, with an age of certainty not more than three thousand, five hundred million years, the whole problem [of evolution] is different. If the existing universe is a creation, some force or other created it by organizing energy in those patterns and with those endurances which we call matter and later with those qualities which we call life in certain parts of the physical creation; and, from the very simplest things that live, to man, the most complicated thing that lives, there extends a power of liking and disliking; that is of experiencing pain, dimly or acutely; of feeling the need for the replenishment of energy, that is hunger; and certainly from the very beginnings of the animal kingdom, there is fear. Now these things are not material things. They constitute the recognizable elements of psyche and the more you study them, the more clearly can they be recognized as the guardian angels of the reproduction, that is of the continuum of the species or, in the simplest forms, the mere continuance of life. . . . Leave man aside for the moment. He always introduces the dreadful problem of the spirit, and you have in every animal species three interwoven continua displayed and these are:—the environmental continuum; the living tissue continuum, which may be quite simple or very complicated; and the continuum of psychic manifestation by which and through which are determined and recognized the activities of the animal.

It is a long letter with much food for thought.



AUCKLAND CAMPBELL GEDDES

Lord Geddes was a man who during his life played many parts. His early ambition was to be a soldier. As a soldier he served in the South African War and the First World War. His participation in the Second World War has been noted. His second role was that of scientist and educator. Thirdly he was drawn into politics and proved himself efficient, forceful, and prophetic. Fourthly he was a successful business executive, responsible for some great mining enterprises. Lastly, when blindness overtook him, he became thinker and elder statesman.

Lord Geddes's honours were many. He was made G.C.M.G., K.C.B., C.B., and Companion of the Order of the Crown of Belgium. He was awarded an LL.D. by McGill, Toronto, Yale, Princeton, Johns Hopkins, Brown, California, Cincinnati, George Washington, and Michigan. He was a Fellow of the Royal Society of Edinburgh and of the Royal Society of Canada. He had been appointed Privy Councillor.

There was a greatness in this man of action, revealed by his conquest of the physical disabilities which assailed him. From birth his eyesight had been weak. He was wounded by a missile during the war. He lost his sight completely shortly after the end of the war, but his spirit never wavered, and this was the period when he wrestled with his thoughts, produced his book, and gave of his wisdom to those who consulted him. Here we have an example of a strong man of action evolving into a thinker who was capable of a critical appreciation of his own descent and of his part in the events of over half a century. During his last years he rested in peace for he never doubted the high destiny of man.

I am very grateful to Dr. W. W. Francis, Dr. R. D. Gibbs, and Dr. C. P. Martin for their help in supplying some of the references to Lord Geddes's scientific papers.

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G. VIBERT DOUGLAS

René Guénette

1897–1954

C'EST à Saint-Jovite que naquit, le 21 décembre 1897, René Guénette, et c'est sur un petit monde de colons-défricheurs que s'ouvrirent les yeux de l'enfant. Quand il eut terminé ses premières classes chez les Sœurs de la Sagesse, il passa chez les Jésuites du Collège Sainte-Marie, à Montréal, qui le plièrent avec autorité aux disciplines classiques. Il crut un instant que l'état ecclésiastique le réclamait et il entra au Grand Séminaire de la métropole. Mais il comprit vite que sa place était ailleurs et, comme il avait du goût pour l'enseignement, il choisit de devenir maître d'école. Après avoir décroché un premier diplôme, puis une licence en pédagogie de l'Université de Montréal, il obtint une bourse du gouvernement de la Province de Québec.

Trois ans d'études à l'Ecole normale de Saint-Cloud et à la Sorbonne, de 1923 à 1926, permirent au jeune instituteur d'ajouter d'autres titres à ceux qu'il possédait déjà, d'acquérir, entre autres choses, une réelle maîtrise de la langue française et une solide préparation pédagogique. Revenu à Montréal, il se vit confier, par la Commission des Ecoles catholiques, l'enseignement du français aux élèves de l'Ecole supérieure Le Plateau. C'est là que René Guénette devait donner le meilleur de lui-même, pendant quinze ans, c'est-à-dire jusqu'au jour où il assuma la direction de la revue pédagogique, *L'Ecole canadienne*.

René Guénette avait compris qu'il importait à l'instituteur de connaître à fond ses élèves, de les traiter avec justice pour pouvoir agir sur eux et les bien former, d'accord avec Montesquieu sur la nécessité de connaître pour aimer et d'aimer pour mieux connaître. Auprès des petits d'abord, puis des plus grands, témoignant une préférence marquée envers les natures difficiles, ne réservant pas ses attentions et ses sourires aux seuls premiers de classe, il voulait être et, au dire de tous ceux qui reçurent ses leçons, il fut sans conteste "le professeur préoccupé non seulement d'instruire ses élèves, mais de former leur cœur, leur caractère, leur âme, selon la tradition chrétienne".

Lorsqu'il fut élu à la Société Royale, en juin 1952, René Guénette ne cacha point la satisfaction profonde qu'il éprouvait. Les fonctions responsables et les honneurs ne lui avaient pourtant pas manqué. Secrétaire adjoint de la Commission des Ecoles catholiques de Montréal, président ou membre de maintes sociétés culturelles et philanthropiques, chargé de missions en Europe, commandeur de l'Ordre du Mérite scolaire, il n'avait ménagé ni son temps, ni ses forces, ni ses conseils. Professeur à la Faculté des sciences sociales, économiques et politiques de l'Université de Montréal, conférencier recherché en raison de ses vastes connaissances, de sa parole élégante et chaude, de son esprit vif, il donnait l'exemple d'une activité débordante. La Société Royale lui offrirait — du moins y comptait-il beaucoup — une sorte de tribune d'où sa voix porterait plus loin encore. Au

surplus, cet enseignement qu'il avait distribué un peu partout, par la plume et par la parole, René Guénette avait pris soin d'en ramasser la substance dans des livres. A huit ans d'intervalle, il avait publié *Essais sur l'éducation* et *La Cité nouvelle*, deux recueils de bonne frappe qui, à eux seuls, méritaient de lui ouvrir les portes de l'académie où de fidèles amitiés lui réservaient depuis longtemps une place de choix.

Accueilli publiquement et solennellement dans les rangs de la section I, au cours d'une séance mémorable, le 23 novembre 1952, René Guénette reporta sur l'enseignement primaire l'honneur dont il était l'objet. N'avait-il pas consacré une partie de sa vie « à attirer et retenir l'attention des élites et du public sur l'institution qui est à la base de l'édifice culturel de toute nation, sur les ouvriers les plus humbles de cet édifice », sur le milieu où, pendant plus de trente ans, s'était exercée son activité professionnelle? Tel était bien le sens de son élection, de cette étape nouvelle qui consacrait sans doute une œuvre fort utile, mais qui en annonçait aussi le prolongement.

La mort brutale, survenue le 21 décembre 1954, n'aura pas permis à René Guénette de donner suite à ses projets, de faire rayonner davantage sa pensée lucide et sa bienfaisante action. Mais l'hommage que j'avais la joie de lui rendre, il y a plus de deux ans, au nom de ses pairs, je n'hésite pas à le reprendre ici avec la même sincérité. « Puissiez-vous trouver dans nos rangs, lui disais-je en terminant sa présentation, une raison nouvelle de travailler avec d'autres, dans un véritable esprit d'équipe, à la sauvegarde et au rayonnement de ces valeurs intellectuelles et morales qui sont l'objet de votre dévotion, que vous avez servies de toutes vos forces avant de venir vers nous, que vous continuerez de servir, car ce sont elles qui assureront finalement le salut du monde. Vous avez dressé, certain jour, un parallèle entre les petits hommes et les petits peuples : « Ils sont nombreux les petits peuples qui ont conquis la gloire. » Et comme c'est la gloire que vous désirez pour le nôtre, pourquoi ne pas souhaiter qu'au moins un reflet de cette gloire vous récompense d'être demeuré fidèle à vous-même ? »

Les bons ouvriers ne sont pas tellement nombreux. René Guénette en fut un. Puisse son exemple nous inspirer tous dans la poursuite des lourdes tâches qui nous réclament !

JEAN BRUCHÉSI

René Guénette

Skuli Johnson

1888–1955

SKULI JOHNSON was born September 6, 1888, the son of Svein and Kristin (Sigurdadóttir) Johnson, in a tiny coastal village in the north of Iceland in the district called Hunavatnssysla. The family migrated to Canada when he was one year old and homesteaded in Saskatchewan near Churchbridge. When Skuli was still a very small boy, his farmer-father died, and no conspicuous future could have been predicted for the orphaned son of a recent immigrant.

A door of opportunity opened when his aunt and uncle in Winnipeg took him into their home and sent him to the excellent public schools in that city. Intelligence and industry issued in notable achievement. At the Isbister School, he won scholarship awards in Latin, English, Greek, and Mathematics. In first-year Arts at Wesley College, University of Manitoba, he won university honours in these same four subjects and also in French and in Roman History. In his second university year, he won a combined scholarship for Latin, English, Greek History, and Philosophy. In his third year, he broke all precedents for a Junior by being chosen as Rhodes Scholar for Manitoba.

His Oxford college was Oriel. Here he enrolled in "Literae Humaniores" and again attained first-class honours. He was described by one of his professors as "a man of indomitable love of learning and industry in its pursuit."

His subsequent years were wholly given over to teaching and to scholarly writing. After two years (1913–15) as classical master at St. John's Technical High School in Winnipeg, he joined the staff of Wesley College, an affiliated institution of the University of Manitoba, first as a lecturer in Classics, and then, in 1917, as Professor of Classics. In 1920 he became Dean of the Faculty of Arts. In January, 1927, he became Professor of Classics in the University of Manitoba, a post which he held up to the time of his death in May, 1955. All his old associates can bear witness to his scholarship, his teaching ability, and his fine qualities of character. A spontaneous testimony meeting of some twenty minutes duration occurred in Section II of the Royal Society in June, 1955, when his recent death was announced and Fellow after Fellow rose to recall the merits of the vanished colleague.

Skuli Johnson was a typical Icelander in his intellectual enthusiasms. That remarkable subarctic race, formed by mixing three parts of Viking with one of Irish, has had a great literary tradition coming down for more than a millennium since the island's first settlement in A.D. 874. Poetry has been its major preoccupation, although Iceland's prose sagas have been characterized as Europe's greatest literary achievement between Vergil and Dante. Far more than any other Occidental nation, the Icelanders have been fascinated by problems of poetic form and have sought to combine the alliteration of their Scandinavian forefathers with the assonances and

internal rhymes of Irish prosody and the rhymes, rhythms, and stanza patterns of France, England, and Italy. In a mediaeval phase of their poetry they also pushed imagism and metaphor beyond all limits of comprehension. The result has been poetic craftsmanship of incredible complexity and rigidity. Familiarity with the rules of the prosodic game is expected of even the humblest farmer and fisherman.

Skuli Johnson was intimately acquainted with this tradition. He had visited Iceland during his Oxford days and taught the Icelandic language at university level, along with Latin and Greek, during his years as a professor at Wesley College. Verse translation from Icelandic into English had an irresistible attraction for him and for thirty years he kept supplying his skilful versions to Winnipeg's two Icelandic weeklies, *Lögberg* and *Heimskringla*. He was a major contributor to *Icelandic Lyrics*, edited by Richard Beck in 1930 and published in Reykjavik in connection with the thousandth anniversary of Iceland's parliament. Still other items in prose and verse were contributed to *Scandinavia*, the *Icelandic Canadian*, and the *American Scandinavian Review*. He himself was editor of *Iceland's Thousand Years*, a series of popular lectures on the history and literature of Iceland published by the Columbia Press in 1945. It is in keeping with this achievement that he was elected honorary president of the Icelandic-Canadian Society and was made a Knight of the Royal Order of the Falcon by the Government of Iceland.

This same passion for experiments in poetic form led him to turn the four books of Horace's *Odes* from Latin into a wide range of English metres. In 1952, a few specimens from this comprehensive manuscript were published by the University of Toronto Press as *Selected Odes of Horace*; but those of us who had heard the full repertory at sessions of the University's "Saturday Club" in the 1930's found the little printed volume very fragmentary indeed. Another phase of his classical studies involved tireless microscopic research into the minutiae of Latin and Greek texts. In a typical paper of this sort, the erudite footnotes might run to a hundred or more and occupy several times as much space as the article itself. Such were the learned essays that he contributed to the *Classical Journal*, the *American Journal of Philology*, and the *Transactions of the Royal Society of Canada*. He was elected a Fellow of Section II in 1954. At the time of his death he was also a member of the Humanities Research Council of Canada.

In keeping with Icelandic tradition, Skuli Johnson was a skilled athlete. As an undergraduate he had taken part successfully in every branch of athletics. At Oxford, he was secretary of the Lacrosse Club and played lacrosse for Oxford against Cambridge in 1911. In golf, he often preferred to play his eighteen holes with only a mid-iron and a putter, avoiding in his flawless progress down the fairways the hooks and slices perpetrated by those of us who used a larger set of tools and ended with a poorer score.

He was married in 1921 to Evelyn Truesdale of Winnipeg; and is survived by his wife and two sons, Harold and Richard.

WATSON KIRKCONNELL

SKULI JOHNSON

William D. Lighthall

1857–1954

THE death of William D. Lighthall deprives the Royal Society of Canada of a patriotic Canadian, a public-spirited citizen, and a prolific writer on varied subjects.

Born December 27, 1857, in Hamilton, Ontario, where his father held an important position in the government of the Province of Canada, he moved to the Province of Quebec when very young, and became an expert on the history of his adopted province. He began his studies at the Montreal High School and ended them at McGill University, which conferred upon him various degrees: B.A., in 1879; B.C.L., in 1881; M.A., in 1889, and finally, in 1921, D.C.L., *honoris causa*.

Admitted to the Bar of Montreal in 1881, he practised his profession for sixty-three years; he retired in 1944. He was made a King's Counsel in 1906.

His other activities were varied. In the municipal field, he was commissioner of the Town of Westmount in 1899, and its mayor from 1900 to 1902. Some ten years later, he was made president of the Westmount School Commission, and from 1922 to 1927, trustee of its public library. He was one of the founders, in 1901, of the Union of Municipalities of Canada, of which he became honorary president. In 1939, he received the medal of the City Improvement League for his public services.

He was also a member of the Public Parks section of the Metropolitan Commission (1922), and of the Historic Monuments Board of the Province of Quebec.

Interested in military matters, he served in the Prince of Wales regiment in 1877, in the Victoria Fusiliers in 1881, and in the reserve of the latter regiment (1914–17). His daughters and son served in the First World War. He was one of the founders of the Veterans' League, later absorbed by the Canadian Legion; he wrote the constitution of these societies.

Elected in 1902 a member of the Royal Society of Canada, he was president of section II in 1904–5 and president of the Society in 1918–19. He was an honorary member of the Royal Society of England, a charter member of the Canadian Authors' Association, of which he became president, and honorary president, for several years, of the St. James Literary Society.

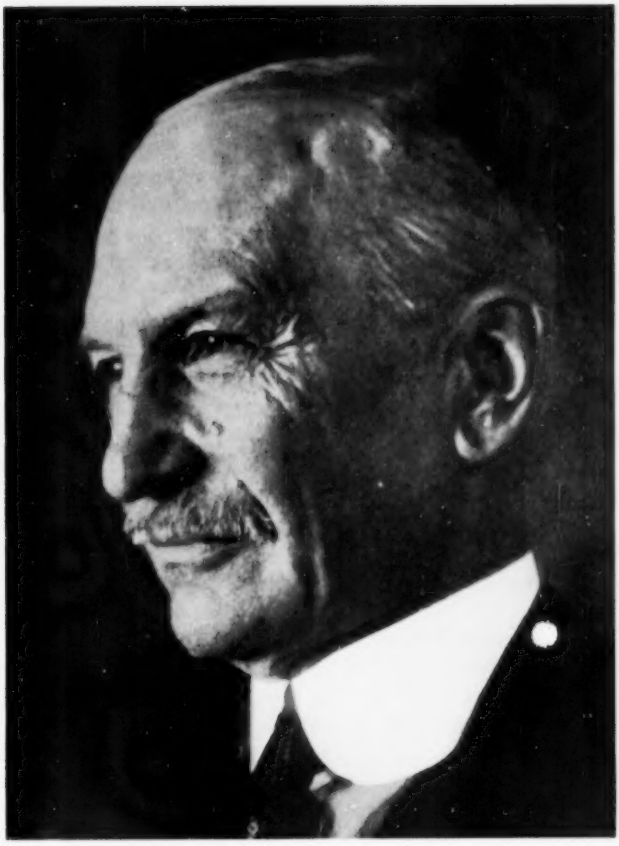
The history of his country also interested Mr. Lighthall. He was a member of the committee which erected the Maisonneuve Monument in Montreal, in 1895. Vice-president of the Antiquarian and Numismatic Society of Montreal, he was instrumental in the transformation of the Château de Ramezay into a museum. After having been president of the Society from 1912 to 1952, he became its honorary president.

He was a prolific writer, particularly from 1889 to 1907, on the most varied subjects, such as poetry, philosophy, history, and the historical novel.

The above enumeration of the titles of Mr. Lighthall and of the distinctions conferred upon him, incomplete as it is, suffices to give an idea of the services he rendered to his country and of the esteem in which he was held during the ninety-seven years of his life.

Mr. Lighthall died in Westmount on August 3, 1954, leaving his wife, his son, and two daughters, and a brother, who is also a nonagenarian.

E. Fabre-Surveyer



William D. Lighthall

Gilbert Norwood

1880–1954

GILBERT NORWOOD was born in Sheffield, on November 23, 1880, and received his earlier education at its Royal Grammar School. His ability in classical languages soon declared itself, and with the encouragement of the headmaster he went up to Cambridge and entered St. John's College, winning scholarships throughout his years there. At Cambridge he came under the influence of Sir John Sandys, the author of the well-known *History of Classical Scholarship*, and Sir Richard Jebb, famous for his studies in Sophocles and the Athenian orators. Though not one of Verrall's students, he presented an essay on Euripides which impressed that master, and which furnished the basis of Norwood's *Riddle of the Bacchae: The Last Stage of Euripides' Religious Views* (University of Manchester Publications, Classical series No. 1, 1908). He took his bachelor's degree in 1903 and was elected a Fellow of St. John's College, proceeding to the M.A. degree in 1906, and retaining his fellowship till 1909.

Meanwhile, he joined the staff in Classics at the University of Manchester and taught there for five years (1903–8). Conway held the chair in Latin, and Strachan in Greek. On the death of the latter, Norwood carried on his courses, and this experience together with his scholarship, already attested by his Fellowship of St. John's and his work on Euripides, won him the chair of Greek in University College, Cardiff (University of Wales), at the unusually early age of twenty-eight.

This post he held from 1908 to 1926. At Cardiff he was associated with Richmond, who later went to a chair at Edinburgh, and Sir Hector Hetherington, afterwards Vice-Chancellor of Liverpool, and this trio of youthful university reformers were known as "the Ginger group." But Norwood, who was always a prodigious worker, was forging steadily ahead with his classical studies. In addition to verse translations of Euripides and Aristophanes, and some twenty articles and other contributions, mainly on classical subjects, he produced his *Greek Tragedy* (1921, with three later editions in 1928, 1942, and 1948), his *Euripides and Shaw and Other Essays* (1921), *The Art of Terence* (1923), and *The Writers of Greece* (1925; later translated into Spanish). His writings in these years also include between twenty and thirty miscellaneous items, which appeared in *Cap and Gown*, the *Contemporary Review*, the *London Mercury*, the *Manchester Guardian*, the *Hibbert Journal*, and elsewhere. Some of these were collected in *The Wooden Man and Other Stories and Essays* (1926), and some found a place in *Selected Modern English Essays* (World's Classics, 1925) or the *Mercury Story-Book* (1929).

It was, then, with a wide reputation as a classical scholar, and a reputation also as a man of letters, that Norwood came to Toronto, in 1926, to assume the chair of Latin in University College. Two years later he suc-

ceeded Maurice Hutton as Head of Classics, with the new title of Director of Classical Studies, a position which he filled with distinction until his retirement as Professor Emeritus in 1951. The years at Toronto were not less productive than those at Cardiff, with some forty-five articles and reviews on classical subjects and an even larger number on other matters. While continuing his contributions to the learned journals, *Classical Philology*, the *Classical Journal*, the *American Journal of Philology*, etc., he participated fully in the literary life of Canada, writing for the *University of Toronto Quarterly* from its inception and serving on its Advisory Board, and contributing frequently to the *Canadian Forum* and *Saturday Night*. Some of his lighter pieces he collected in *Spoken in Jest* (1938). But the finest product of his later life were his four books on classical subjects, written at the height of his powers, and in their fullest maturity, and each with years of loving study behind it. First came his *Greek Comedy* (1931; reissued in 1932 and 1950), similar in scope to his volume on Greek tragedy, which he revised in 1948; next, his *Plautus and Terence* (in the series "Our Debt to Greece and Rome," 1932); then, perhaps his finest effort in literary criticism, supported by encyclopaedic learning on its subject, his *Pindar* (1945; later translated into Italian); and, finally, the book of his last years, in which he returned to his first subject, *Essays on Euripidean Drama* (1954). Nor should one omit as testimony to his interest in Latin as well as Greek, and in grammar as well as the finer points of language and literary criticism, his little work on the *Syntax of the Latin Gerund and Gerundive* (1936).

To get a full sense of the range of Norwood's interests, combined as it was with the strictest standard of exact scholarship in his chosen field, one must turn to the bibliography assembled in *Studies in Honour of Gilbert Norwood* (1952). While his preference was for Greek, and (among the forms) for drama, he had a scholar's knowledge of the whole extent of classical writing, Greek and Latin, and moved through it with equal facility and precision, the fruit of much reading and re-reading. Of choice, he varied his courses from year to year, and thus taught at one time or other most of the extensive honours curriculum at Toronto, both in language and in literature. Though not in general convinced of the value of classical literature in translation, he devised such a course on the Roman satirists and their influence, in which he passed happily from Horace, Juvenal and Propertius to Dryden, Pope and Johnson. As a teacher, his standards were exacting, but his interest was contagious. Not only did Euripides and Terence come to life in his hands, but (as one of his former students said) so did the Greek subjunctive. This is not the place to speak of Norwood's contribution to, and gentle modification of, classical studies at Toronto, and of the complementary character of his work with Owen's and Cochrane's, or to consider in detail his methods as classical scholar and literary critic, which not only informed his writings, but permeated his teaching. For some account of these matters the reader may perhaps be referred to

GILBERT NORWOOD

my essay on the Staff, 1890–1953, in *University College: A Portrait* (Toronto, 1953).

From earliest days, Norwood's quality and achievement were recognized: first, by his Fellowship of St. John's, next, by his early appointment to his chair at Cardiff, then, by his membership of the British Universities' Delegation to Belgium (1919), his honorary degree of D.Litt. from the University of Wales (1933), his Fellowship of the Royal Society of Canada (1943), his Sather Visiting Professorship at California (1943–4, when his lectures on Pindar were delivered) and his honorary membership of Phi Beta Kappa (Leland Stanford University), his Visiting Professorship at Chicago (1945), his appointment as Professor Emeritus at Toronto (1951), and finally by the volume of *Studies* in his honour (1952) mentioned above.

Besides his classical scholarship, Norwood had English literature at his command, and French, Italian and German as well. He had a keen relish for style, and Burke and Pater were among his special favourites. Prolific as was his own writing, he had a feeling for expression, took pains with it, and achieved a degree of perfection, not always attained by classical scholars, or for that matter scholars in modern literature. There seemed to be nothing that Norwood had not read, and little that he had not enjoyed; for he combined with a fine and discriminating taste a gusto that could read works of lesser merit for entertainment and for whatever virtue they might possess. He would often laugh at them, for his sense of the ludicrous was irrepressible; but his laughter, whether at books or persons, was not condemnatory: it was forgiving.

Not for his scholarship only, but also, and above all, for his rich humanity, Norwood's friends will cherish his memory. He was an incomparable raconteur and the most delightful of companions, whether at some convivial gathering where he "set the table on a roar" or in the intimacy of his own home, with Mrs. Norwood, herself a classical scholar and one of his former students, presiding as hostess. Indeed, it is impossible to think of Norwood as other than alive and interested and happy.

A. S. P. Woodhouse

Matthew A. Parker

1871–1953

THE death occurred on Sunday, November 29, 1953, of Professor Matthew A. Parker, B.Sc. (Glasgow), LL.D. (Man.), at the age of 82. He was for thirty-three years Head of the Chemistry Department at the University of Manitoba, from the inception of the University as a teaching institution, in 1904. On his retirement in 1937, Professor Parker was honoured with the title of Emeritus Professor. Dr. Parker was a Scotsman, born in Renfrewshire and educated at the University of Glasgow, where he took the B.Sc. degree. After a year's post-graduate work at Heidelberg, where he was trained in the classical research methods of organic chemistry, he returned to his native Glasgow, as a lecturer at the Royal Technical College. He later became lecturer in organic chemistry at the University. In 1904, he came to Winnipeg to establish the new Department of Chemistry, which had just been created by the University of Manitoba. Prior to this date, the University had existed only as an examining body. Along with Professor Parker, three other professors, heading three different departments, were also appointed, viz. Swaile Vincent to Physiology, Reginald Buller to Botany, and Frank Allen to Physics; all of them have had distinguished careers.

On his arrival in Winnipeg, Dr. Parker found his department to consist of one laboratory, unfurnished, one lecture theatre, no staff but himself, and eight students, among whom, however, was Dr. T. Thorvaldson, now the distinguished Professor Emeritus of Chemistry at Saskatchewan. From this humble beginning he built up a chemistry department in the best traditions of Europe, and of Scotland in particular. Of necessity, the department was for long a purely teaching department, but Professor Parker was always keenly alive to the necessity for research and, as his staff enlarged, he endeavoured to appoint men who would carry on or encourage research. The First World War and still more the depression hampered development, but when he retired in 1937 (through an infection of the eyes, unhappily, for he was still otherwise vigorous) the number of students in the Department had increased to 800, and the staff to five. For many years, Professor Parker was the only trained chemist in the Province and for many years he acted as Provincial Analyst.

What precedes is a bald account of the facts; it gives no impression of the profound influence Dr. Parker had on all who knew him. To say that a man has no enemies gives an impression of a colourless individual, too insignificant to be hated, but Dr. Parker had no enemies because he inspired everyone with affection. He was a gentleman of the old school, obviously brought up in easy circumstances, but his courtesy was heart-felt; it was not an acquired code. Over the years, he had developed a passionate love for music. Commencing with an old hand-wound gramophone, to which

he long clung, with an obstinate affection, he eventually graduated to the inevitable radio-gramophone. Three days before he died he was listening with rapt attention to a Beethoven trio.

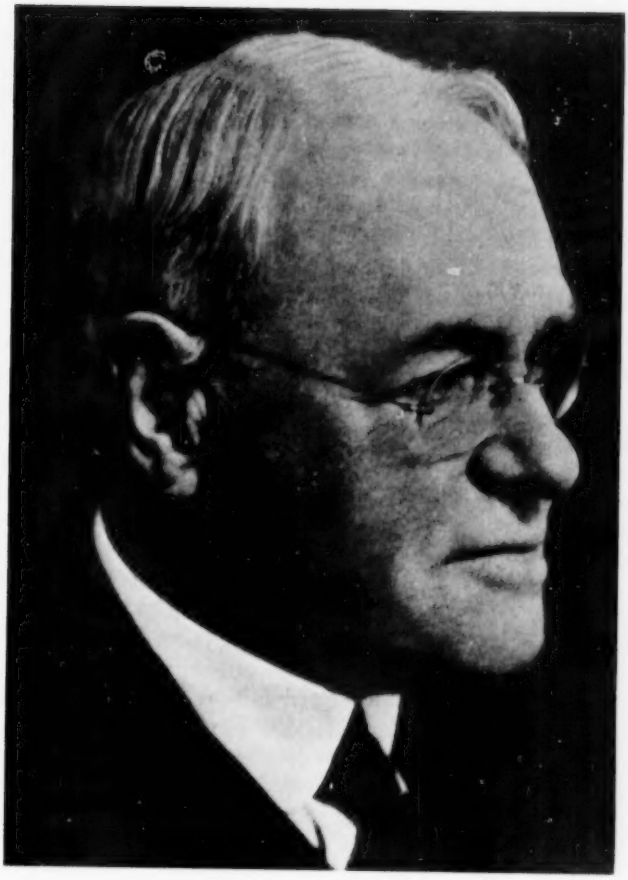
When Dr. and Mrs. Parker first arrived in Winnipeg, in 1904, the city must have presented many of the aspects of the truly Wild West; it was bursting at the seams in a period of rapid expansion. Even the main streets of the city had wooden side-walks. One cannot help speculating on what the impact of the west must have been on this couple fresh from a rather sheltered existence in the Old Country. It did not take them long, however, to come to terms with their new surroundings. They took a full share in the social and educational activities of those stirring days. Although a loyal and patriotic Canadian, Dr. Parker always retained the habits of his upbringing; neither his accent nor his speech showed any trace of Canadianese.

Dr. Parker's life was spent in the service of his country and his fellowmen. He died, swiftly and almost painlessly, when full of years and honour. He had his troubles, as who has not, but it is impossible to contemplate a long, honourable, and useful life like his without the satisfaction that is felt in anything perfect of its kind. "Here is no cause to wail or knock the breast." His life was "one entire and perfect chrysolite."

So far as is known, Professor Parker published only two research papers: "The Action of Bromodiphenyl Methane on Ethylenic Sodioaceto Acetate" (with G. G. Henderson; Trans. Chem. Soc. 1897, p. 676 and Proceedings, p. 119); "The Influence of a Magnetic Field on Certain Chemical Reactions" (with H. P. Armes; Trans. Roy. Soc. Canada, *18* (1924), 203). Before leaving Scotland, he collaborated with the late Professor G. G. Henderson, long Professor of Chemistry at Glasgow, in writing a little book on analysis which was for many years a standard text.

Professor Parker is survived by his widow and three daughters.

A. N. CAMPBELL



MATTHEW A. PARKER

Antonio Perrault

1880–1955

LA personnalité d'Antonio Perrault s'est affirmée non seulement en science juridique, mais également dans les domaines politiques et sociaux.

Profondément consciencieux, il hésitait à se charger d'une cause à moins d'être convaincu de la justice des prétentions de son client et des probabilités de les faire valoir avec succès; je l'ai vu refuser d'accepter la contestation judiciaire d'un testament dont l'ambiguité aurait pu lui rapporter de forts honoraires, en donnant pour raison de son refus que la jurisprudence des tribunaux supérieurs favorisait plutôt la thèse de l'adversaire.

Y aurait-il lieu de disserter à ce sujet si l'avocat doit faire abstraction de sa personnalité au point de prêter son ministère au client qui retribue ses services, même s'il croit qu'il a tort ? Les avis sont partagés sur cette question. Le groupe de ceux qu'on pourrait dire « matérialistes » professe que l'avocat ne peut refuser de faire valoir les prétentions du client qui lui demande de le représenter, tandis que le groupe « éclectique » estime que sa profession exerce un sacerdoce au service de la justice, et que ses membres n'ont pas le droit d'agir contre les dictées de leur conscience. Inutile d'indiquer de quel camp Perrault faisait partie.

Mais c'est surtout dans l'enseignement universitaire que notre regretté collègue excellait. Ceux qui ont suivi ses cours à la faculté de droit ne cessent de louer la lucidité qu'il apportait dans l'exposé de sa doctrine, la subtilité de sa dialectique, la logique de ses conclusions et l'étendue de son savoir. Ecrivain d'une intégrité scrupuleuse, il nous avoue candidement dans la préface de son *Traité de droit commercial*, avoir amassé, compulsé et mis à point *pendant vingt ans* les notes destinées à la préparation de cette œuvre magistrale avant de se décider à livrer son manuscrit à l'imprimeur.

Et pourtant, sa modestie, sa conviction immanente de l'imperfection de toute œuvre humaine lui faisaient dire avec Alfred de Vigny : « Je travaille comme si l'on devait me lire : chacun a ses illusions. » Il n'était même pas loin de penser avec Sainte-Beuve que les bibliothèques ne sont en somme que des cimetières où de rares fidèles vont parfois faire à un auteur l'aumône d'une visite furtive.

Né à la Malbaie le 15 septembre 1880, du mariage de Stanislas Perrault, avocat et député du Comté, avec Louise Brault, le jeune Antonio fit son cours d'études classiques au séminaire de Québec à la suite de ses frères ainés Joseph-Edouard, futur ministre de la Couronne à Québec et Gustave, futur juge en chef de la Cour des Sessions de la Paix à Montréal, mais c'est dans cette dernière ville qu'il vint faire ses études de droit à la « succursale » de l'université Laval de Québec car, bien que métropole du Canada et siège d'un archevêché, la fille de Maisonneuve n'avait pas encore été jugée digne d'autonomie à cet égard.

Admis à la profession d'avocat au mois de juillet 1906, il était agréé, l'année suivante, à faire partie de la firme Gouin (sir Lomer), Lemieux (hon. Rodolphe), Murphy et Berard, dont Léon Mercier Gouin (aujourd'hui sénateur) et Maxime Raymond (fondateur du parti politique le *Bloc populaire*) furent également invités à faire partie plus tard. En sympathie plus étroite d'opinions avec ce dernier, il fondait en 1919 la société Perrault et Raymond qui se dissolvait en 1930 et il s'associait sons fils Jacques nouvellement admis au barreau en 1934. Elu par ses confrères à la dignité de bâtonnier de son Ordre pour le district de Montréal en 1944, il était aussitôt appelé à remplir la même charge à titre de président général pour la province de Québec.

Il avait épousé en 1909, Marguerite Mousseau, fille de l'ancien premier ministre de cette province, Joseph-Alfred Mousseau décédé en 1886. Quatre enfants sont nés de cette union : Odile, épouse du docteur Jean Panet-Raymond; Ghislaine, épouse du journaliste André Laurendeau et Jacques, aujourd'hui chef de l'étude Perrault, Décary et Lussier. Ces trois enfants continuent, chacun dans sa sphère, les œuvres et les traditions paternelles; l'autre enfant est décédé prématurément.

Les charges et les distinctions honorifiques ne tardèrent pas à répondre au besoin d'activité d'Antonio Perrault. Dès l'année 1904, alors qu'il n'était encore qu'étudiant en droit, il se joignit au groupe fondateur de l'Association catholique de la Jeunesse canadienne (l'A.C.J.C.) dont il fut le premier président pendant quatre ans et directeur de sa revue le *Semeur*.

Appelé à succéder au juge sir Horace Archambault en 1912 dans la chaire d'enseignement du droit commercial à son université, il en est resté titulaire en y donnant un enseignement d'une rare compétence jusqu'en 1940, alors que se terminait la publication de son troisième et dernier tome de droit commercial : il se retirait alors de l'enseignement universitaire avec la distinction de professeur émérite.

Créé Docteur en droit après soutenance d'une thèse remarquable en 1915 et Conseil du Roi en 1916, il était élu membre de la Société royale du Canada en 1917 et se joignait à l'abbé Lionel Groulx la même année pour fonder la *Ligue d'Action française* ainsi que sa revue officielle qui défendit vaillamment les droits de la race canadienne-française jusqu'en 1926. La droiture de sa doctrine et la sûreté de son jugement lui valaient en outre d'être appelé à siéger au Conseil de l'Instruction publique en 1929, charge à laquelle il fit honneur jusqu'à sa mort.

Trop actif pour déposer la plume en même temps que l'enseignement après la publication de son *Traité de droit commercial* en 1940, il se joignit à un groupe de confrères pour fonder la *Revue du Barreau* appelée à succéder à la *Revue du Droit*; il en accepta la présidence et la direction qu'il a toujours conservées. On peut se faire une idée de l'abondance de son œuvre dans l'hommage que lui rendit la rédaction de cette revue au lendemain de sa mort en rapportant le fait qu'il avait publié *quatre-vingt-neuf* articles dans ses colonnes durant les quatorze années de son existence. Et

Antonio Perrault

songeons qu'il alimentait en même temps les travaux de la Société royale, ceux des autres institutions dont il était membre et, à l'occasion, les colonnes des journaux où ses articles d'actualité sur les questions du jour étaient toujours accueillis avec empressement.

Fervent catholique et patriote éclairé, Perrault ne pouvait manquer de se joindre aux initiatives des *Semaines sociales*, aux œuvres de la Société de Protection et de Renseignements, et surtout aux charités de la Société Saint-Vincent de Paul. Il fit également partie de cette pléiade de jeunes enthousiastes qui, sous la conduite d'Henri Bourassa et d'Armand Lavergne, plaçaient la doctrine du *nationalisme* catholique et canadien-français au-dessus de tout autre devoir, même au détriment de leurs intérêts personnels.

Il rencontra dans cette phalange quelques enfants terribles, tels que Olivar Asselin, Jules Fournier et Tancrède Marcil, mais leurs incartades étaient contre-balancées par la solidité de doctrine des Lionel Groulx, des Anatole et Guy Vanier, des Omer Héroux et autres paladins des croisades religieuses et nationales. Perrault était le modérateur attitré du groupe et il devint en même temps conseiller juridique du journal le *Devoir*, après la retraite de Maître Paul Saint-Germain appelé à sigéer à la Cour d'Appel. Il réussissait presque toujours à calmer les écarts les plus agressifs des bretteurs de la cause, tant par la dialectique serrée de son argumentation que par la pondération de son esprit conciliateur; mais les exploits de ce genre n'étaient cependant pas toujours faciles à conduire à bonne fin. Un jour que j'avais argumenté sans résultat avec Asselin pour obtenir une expression de regrets à l'adresse de son archevêque au sujet d'un incident survenu à la Société Saint-Jean-Baptiste, j'eux recours à Antonio Perrault pour me prêter main-forte. Après une longue argumentation, nous pûmes obtenir une capitulation que le bouillant Olivar consentit à rédiger et qui nous parut acceptable... sauf une expression qui dénaturait complètement le sens du document et que Perrault lui demanda de retrancher.

— « Pas une miette, répondit Asselin avec emportement; j'ai torturé votre texte en tous sens afin de pouvoir y glisser ce mot-là et il va y rester sans quoi je ne signe pas ! »

Devenu veuf en 1936, Perrault avait tout d'abord habité avec la famille de sa fille Odile, mais il avait fini par prendre un appartement privé à l'Hôtel Windsor afin de pouvoir écrire plus facilement ses articles dans le silence de la retraite. Sa carrière fructueuse et bien remplie prenait fin le 19 janvier 1955 à l'hôpital Notre-Dame après quelques jours de maladie, dans sa 75è année d'âge.

Travailleur acharné jusqu'au dernier jour, il avait adressé à sa chère *Revue du Barreau* deux articles qui ont été publiés au moment même de sa mort, l'un sous le titre « Justice et Droit », deux mots qui résument sa vie professionnelle et l'autre sur « La femme mariée », condition juridique à laquelle il s'est fortement intéressé. Fidèle à la doctrine des auteurs et aux traditions, il admettait tout de même que la justice et le droit doivent s'adapter aux

conditions nouvelles de l'existence, à l'époque et dans le milieu où l'on vit. Aussi se permettait-il de commenter avec impartialité la justesse, les avantages et les défauts des arrêts et de la législation nouvelle au strict point de vue de la justice et de leur opportunité.

La maxime de sa vie peut se résumer en un mot : celui qu'il inscrit au frontispice de son œuvre juridique, « SERVIR ».

VICTOR MORIN

Bernard Keble Sandwell

1876–1954

BERNARD KEBLE SANDWELL, who died on December 7, 1954, had been a member of the Royal Society of Canada since 1925. He was born in 1876 in England, the son of a Congregational minister, and came to Canada at the age of twelve. He was educated at Upper Canada College and at the University of Toronto, from which he graduated in Classics in 1897. When in 1953, sixty years after enrolling as a freshman, at the centenary celebration of his old college, University College, he received an honorary doctorate from Toronto, he declared: "If it had not been for my brief studentship under Maurice Hutton I doubt whether I should ever have been invited to stand upon a university platform. He civilized me. He converted me from a barbarian into a civilized man." And during the last fifty years of his life it would have been difficult to find in Canada a more distinguished example of the value of a classical education than B. K. Sandwell. His power of incisive analysis, his cool and balanced judgment, his wit and urbanity and irony, all marked him as the classical scholar in public affairs.

For four years after World War I he was a member of the Department of Economics at McGill under Stephen Leacock. From 1923 to 1925 he was Head of the Department of English at Queen's. Happy the universities whose professors of Economics know how to write English and whose professors of English know something about life. But, save for this interval, he spent most of his adult years in journalism. After beginning on the Toronto *News*, he worked from 1905 to 1911 on the editorial staff of the Montreal *Herald*, and then from 1911 to 1918 as assistant editor and as editor of the *Financial Times*. From 1932 to 1951 he was editor of the Toronto weekly *Saturday Night*, and it was in this position that he made his great reputation. Before he left *Saturday Night*—he ended his career as a columnist on the *Financial Post*—he had become the dean of liberal journalists in Canada.

His wide range of interests—he wrote with equal ease on political, economic, social, or cultural questions—and the geniality and grace with which he expressed himself, made the "Front Page" editorials of *Saturday Night* outstanding in the Canadian journalism of his time. He had a passion for the theatre and was accustomed to write dramatic criticism in his paper under the pseudonym of Lucy van Gogh. His sympathies, catholic in their breadth, extended from the Royal Society to the Canadian Authors' Association, of which he was one of the founders and the first secretary. He was ever a vigorous fighter for civil liberties, including the liberties of university professors. He achieved the impossible by living and writing

for a generation in Toronto and managing, week after week without fail, to remain cheerful and serene. That such a man should have become one of the most influential editors of our day is in itself some proof that the Canadian people may be reaching a certain intellectual maturity.

FRANK H. UNDERHILL

Bernard Keble Sandwell

Donald Young Solandt

1907–1955

IN the recent death of Dr. D. Y. Solandt, the Royal Society of Canada lost one of its outstanding Fellows in the field of medical research. Born in Ottawa, the son of Edith MacLennan (Young) and the late Donald McKillop Solandt, D.D., he received his secondary education in Toronto and went on to the University of Toronto where he took his B.A., M.A., and M.D. degrees. A brilliant undergraduate, Dr. Solandt lived to fulfil the promise of his student days. He conducted post-graduate work in the University of Pennsylvania and later in England. In 1936 he obtained his Ph.D. degree from the University of London. Upon returning to Canada, Dr. Solandt became Assistant Professor in Physiology, University of Toronto, and later a full Professor in the same Department. In 1941 he was appointed Professor and Head of the Department of Physiological Hygiene, and in 1944 received his D.P.H. degree from this University. Dr. Solandt was one of the authorities on this continent on the physiology of muscle and made many important contributions in various fields of research. In recent years his main interest was in the field of biophysics as applied to physiology and public health.

During the Second World War, Dr. Solandt served for three years in the Medical Research Division of the Royal Canadian Navy (with the rank of Surgeon Commander) and was responsible for many significant researches on vision and hearing and related biophysical matters. In 1947 Dr. Solandt was awarded the Medal of Freedom with Bronze Palm by the Government of the United States in recognition of his wartime naval medical research in general and his great contribution to the protection of night vision in particular.

Dr. Solandt contributed to many committees of the National Research Council of Canada. He also served on the Advisory Committee of the Department of National Health (Canada) and the American Public Health Association. He was an Honorary Fellow of the American Medical Association and was a member of numerous scientific societies among which were: the Physiological Society (Great Britain), American Physiological Society, American Public Health Association, Canadian Physiological Society, Ontario College of Physicians and Surgeons, Toronto Academy of Medicine, etc.

Dr. Solandt was author of a text *Highways to Health* and contributed many scientific papers to medical and biophysical journals.

Dr. Solandt was a man of phenomenally wide interests and he had an extensive knowledge of literature, music, and natural science as well as of his own field. His friendship was a rewarding experience and he will be

vividly remembered for his courage, his loyalty, and for the exceptional keenness and adaptability of his mind.

Dr. Solandt married, in 1936, Barbara Garrard, a Science graduate of Cambridge whom he met while working with Professor A. V. Hill in London. His widow survives him as do three daughters, Barbara, Sandra, and Diana.

CHARLES H. BEST

Donald Young Solandt

Robert Meldrum Stewart

1878–1954

ROBERT MELDRUM STEWART was born in Gladstone, Manitoba, December 15, 1878, of Scottish-Canadian ancestry; his father was a Presbyterian clergyman. In his early education, due to the influence of his father, the emphasis was on classics rather than science and when he entered the University of Toronto in 1898 it was with a love of the Greek and Latin classics and of English literature which remained with him throughout life. He chose science for his life's work, however, and followed the course of Mathematics and Physics at Toronto where he graduated with high honours, winning the University Gold Medal in 1902. He returned to take his M.A. degree in 1903 and upon graduation joined the Astronomical Branch of the Department of the Interior, becoming a member of the staff of the new Dominion Observatory then under construction.

Mr. Stewart's scientific work at the Dominion Observatory, where he spent the remainder of his working life, included the determination of precise longitudes, the creation and development of the time service of Canada, and the inauguration of an extended programme of observations of precise stellar positions with a meridian circle telescope.

Longitude determinations were a major part of the Observatory activities when Stewart first joined the staff in 1903. He was closely associated with this work and took a great interest in its development up to the time it became the responsibility of the Geodetic Survey of Canada. The first longitude determination dependent on the reception of wireless time signals was carried out under his charge in 1914. The combination of accurate time plus the use of wireless signals for the correction of the watches and chronometers of field parties was a major advance in Canadian surveying for which Stewart was largely responsible. He not only took an active part in the organization and direction of field parties in Canada, but he was also personally associated with two major world longitude programmes in 1926 and 1933.

The time service of Canada had its origin in the longitude programme. It began with relatively primitive equipment before the completion of the Observatory and was built up to its present status almost entirely by Stewart's initiative. A major advance in accuracy was the acquisition of a Shortt pendulum clock in 1920. He also developed complicated time-signal machines controlled by a master sidereal clock to provide accurate and dependable distribution of time not only in Ottawa but throughout Canada. At first wire services were employed, but in 1923 wireless telegraphy was used regularly for the first time and in 1927 the Observatory established its own broadcasting station. In 1942 crystal clock timekeeping was introduced and before Stewart's retirement, plans had been drawn up for the development of a photographic zenith telescope, a project which has since been completed.

Another major development in Canadian astronomy, which was almost entirely due to Stewart, was the setting up of a meridian circle telescope and the initiating of a programme of accurate determination of fundamental star positions. Without previous experience in this field he showed remarkable ingenuity and resourcefulness in detecting and eliminating the numerous sources of instrumental errors which are peculiar to installations of this kind. Once the observing programmes were well started his mathematical insight was effectively applied to the statistical problems of dealing with large numbers of stellar observations, and the Dominion Observatory catalogues containing nearly 10,000 accurate stellar positions must be regarded as a monument to his industry and ability.

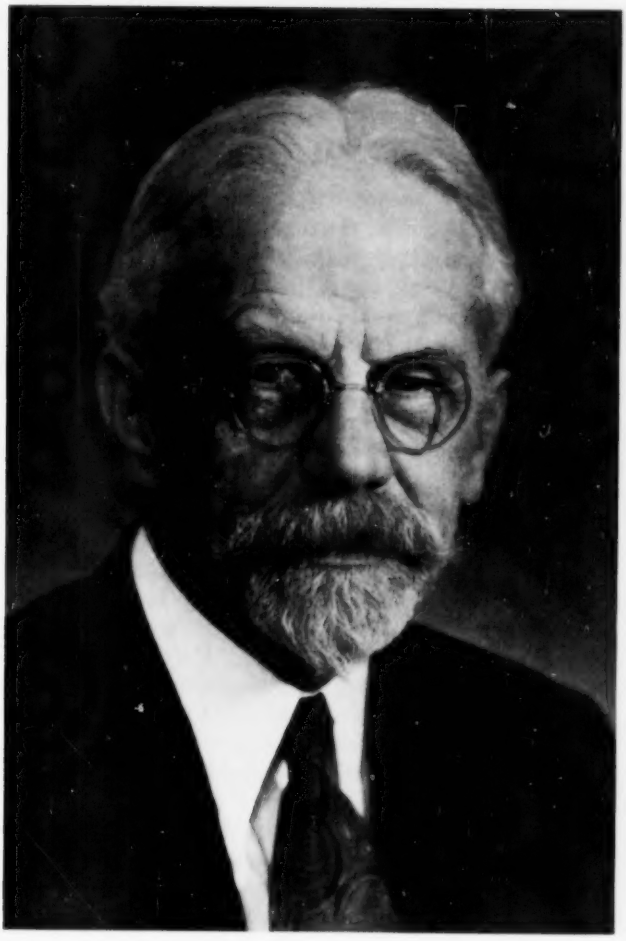
Stewart was appointed Director of the Dominion Observatories in 1924 and held this position till his retirement in 1946. In this capacity his keen mathematical mind and his ability to put his finger on the weak point of a scientific argument were of the greatest value in supervising a wide variety of astronomical and geophysical projects. He was impatient with vague or inaccurate thinking but would give strong support to subordinates who could convince him of the value of their ideas. His standards of duty and integrity were high and he expected equally high standards of his associates.

Stewart was elected a Fellow of the Royal Society of Canada in 1926. He was also a Fellow of the Royal Astronomical Society and of the Royal Astronomical Society of Canada. He was president of the latter organization and honorary president in 1931. He was also a member of the Astronomische Gesellschaft and of La Société Astronomique de France. He was interested in literature, music and various kinds of sporting activities in particular boxing, tennis, and boating.

Stewart was married to May Dickson in 1904 and his wife, who survives him, is now living in Toronto. One son and four daughters were born of the marriage. Of the two surviving children, Mrs. W. K. Ross lives in Montreal and Mrs. Wilfred Saunders in Toronto. His son died in infancy while the two younger daughters, Molly and Dorothy, passed away a few years ago. One of the characteristics for which Stewart is remembered by his friends is his devotion to his family especially his two younger daughters who reached young womanhood only to be carried off by illness.

Stewart's passing leaves a gap in the Canadian scene that is not likely to be filled by any of his younger colleagues. He was in the best sense of the term, a gentleman of the old school. His bearing, his habits of thought, and his intellectual and aesthetic standards, were recognizably those of a superior nature and different from, without being antagonistic to, those of the present day. He was a man of strong feelings which were normally concealed by the dignity and reserve of his manner. One of the things which the writer remembers was his capacity, even in the face of events which caused him acute distress or sorrow, to maintain an inner philosophic calm which communicated itself to others.

C. S. Beals



Robert Meldrum Stewart

Robert Charles Wallace

1881–1955

ROBERT CHARLES WALLACE was born in the Orkney Islands June 15, 1881. He got his education in high school and university mostly by scholarships. He began with an Arts degree and then went on to three degrees in pure science: from Edinburgh, M.A. in 1901, and after three years as science master in secondary schools, B.Sc. in 1907; from Göttingen, Ph.D. in Geology and Mineralogy in 1909; from Edinburgh in 1912, D.Sc. for studies begun at St. Andrews, where in 1909–10 he had been research scholar and demonstrator in Crystallography.

He came to Canada in 1910 as lecturer in Geology and Mineralogy at the University of Manitoba. In 1912, having been made Professor and having completed his research for the Edinburgh D.Sc., he married Elizabeth Harcus Smith, who had been his pretty pupil in the Kirkwall Grammar School and later an M.A. student at Edinburgh while he was back to work for his B.Sc.

Dr. Wallace served the University and the Province of Manitoba with energy and distinction from 1910 to 1928. For three of these years, 1918–21, he was on leave from his teaching and research to be Commissioner of Northern Manitoba. He had powers like those of the governor of a Crown Colony. "Whatever you recommend, we'll do" was the promise to him. His headquarters were at The Pas, 500 miles north of Winnipeg, in a pioneer mining, lumbering, and fur-trading district, with a scattered, diverse population. He travelled constantly, by canoe in summer, by dog-team in winter, always close to humanity in the raw, settling disputes and seeking the improvement of country and people. So great was his success that in 1926 the Province asked him to be Commissioner of Mines and Natural Resources while he carried on his work at the University.

In 1928 Dr. Wallace was appointed President of the youthful University of Alberta, and he remained there till 1936. He was the second President, succeeding the creative and forceful H. M. Tory and closely matching him in all his powers. These two made what had been only a dream in 1905 into a great modern university in less than thirty years.

Then Queen's University at Kingston claimed Dr. Wallace, who seemed a man made in its own image. In 1930 it had recognized his quality with an honorary LL.D.; in 1936 it promptly invited him to be Principal when the brilliant Sir William Fyfe left to be head of Aberdeen. Founded by Royal Charter in 1841, Queen's was one of the oldest universities in Canada. It had strong humanistic traditions and great pride in its past. Grant was still a living memory. It had not desired to be big or complex, but only to do a few things extremely well. In his fifteen years as Principal, Dr. Wallace changed much and added much in an effort to meet the growing needs of the modern world.

He added a School of Nursing, a School of Physical and Health Education, the Department of Industrial Relations, the Institute of Local Government, a Board of Graduate Studies, a Biological Research Station at Lake Opinicon, and gave to the Summer School, along with other special activities, a School of the Fine Arts and an English School for Quebec students and any others whose native speech is not English.

In his time, Biochemistry and Chemical Engineering each got a new building and the Mining and Metallurgical Laboratory an extension; Clark Hall was built to supply clubrooms for the Engineering Society and more space for the bookshop which it operates; a large new Students' Memorial Union, replacing a fire-casualty, provided clubrooms for staff and gave limited privileges to women students. For the latter also was begun a new dining hall and a new residence as wings to the original building. Thus the efficiency of work and the amenities of life were both increased.

Research in all faculties was vigorously stimulated. With University co-operation, the Kingston General Hospital expanded its patient, clinical, and research facilities to the great gain of the Faculty of Medicine. An Ontario Cancer Clinic was given space. A synchrotron was added to the equipment in Physics to promote atomic studies. Grants for special researches were got from many sources.

Principal Wallace strove steadily for better teachers and better salaries. "A dull teacher with no enthusiasm," he said, "commits the unpardonable sin." He put Queen's salaries on a competitive basis with those of richer universities so that he could get and keep staff of the highest quality. Four times in his fifteen years he extended the scale of pay. He also increased retiring annuities and initiated the policy of supplementing them for older persons whose accumulations were slender because of a previous long period of low salaries. He made more generous the provision for sabbatical leave. A chaplain was appointed to give religion a clearer voice and to do whatever else was relevant to the good life. The human side of the University, always strong, became still stronger. Content prevailed.

An Endowment Office was set up to make fund-raising continuous, not sporadic. Adjoining Public Relations and Publicity offices were provided to smooth and widen contacts. A system of annual giving by graduates was established; the City of Kingston began grants for endowment; the Province of Ontario increased its help. Revenue multiplied two and a half times.

All this took the eye; more was unseen. Principal Wallace was at heart a teacher. Each year in a series of lectures he introduced new students to the main divisions of learning. Within and without the University he made many speeches, always to inform and improve. The public platform was his podium, the printing press his farther-reaching voice. Over 160 of his speeches and writings have been published in appropriate journals and two series of lectures as books: *A Liberal Education in a Modern World* (1932) and *Religion, Science and the Modern World* (1952).

These examples show Dr. Wallace's range. In his first period, following

ROBERT CHARLES WALLACE

Göttingen, he wrote as a research scholar: "Indium und Thallium in Krystallographischer Beziehung," "A Contribution to the Study of Dolomitization." As a Professor at Manitoba, he was a practical scientist, seeking to develop the resources of the Province: "The Geological Formations and Mineral Resources of Manitoba," "Copper, Zinc and Gold Mineralization in Manitoba." As a university president he gave most attention to education in various aspects: "The Humanism of Science," "Agricultural Education in School, at College, and in Later Life," "Looking Forward in Education," "The Meaning of Education," and so on for thirty titles or more. As a member of the Committee on Reconstruction, he wrote on "Rebuilding the World," "The Place of Road Construction in Post-War Rehabilitation." Above all he was dedicated to ideals of living: "The Balanced Life," "The Integrated Life," "The True Happiness." By pen and speech he tried to make a better world.

Dr. Wallace retired as Principal of Queen's in 1951 at the age of seventy. Trustees, Council, staff, students, and graduates spoke their proud "Well done" in a profusion of gift-giving and praise, in all of which Mrs. Wallace shared. At a reception in their honour the Chairman of the Board of Trustees said in graceful compliment that the best thing Dr. Wallace had brought to Queen's was Mrs. Wallace. She, aware of a few disadvantages in being the wife of such a busy, much-travelling man, replied in her quiet humour: "I don't think I hindered my husband much. I wish I could have hindered him more."

Dr. Wallace's energies were still burning brightly. He could not rest or rust. So he accepted various appointments. He became Executive Director of the Arctic Institute of North America, Consultant to the Department of Education of Ontario, Member of the Defense Research Board and its Selection Comittee, and Advisory Editor of the *Encyclopedia Americana*. These were not honorary posts. They involved travelling, conferences, and writing. In addition he continued his public speaking. Thus his life was filled with work almost to the end. He died January 29, 1955, in his seventy-fourth year.

"There is no way to knowledge and ultimate wisdom," he once said, "but by hard work and pleasure in it." That in brief tells the story of his life.

A throng of honours acclaimed him. The King made him Companion of St. Michael and St. George. The Prime Minister selected him as one of three—the only university head—to represent Canada at the London conference which created the United Nations Educational, Scientific, and Cultural Organization, known as UNESCO. He was one of its most active moulders. He was the first Canadian Trustee of the Carnegie Foundation for the Advancement of Teaching. He was offered the headship of a larger and richer university. He was a member or fellow of ten learned societies and a member of ten government or educational committees, and, for the usual term, president or chairman of half of them. He was Fellow of the Geological Societies of London and of America and of the Society of Eco-

nomic Geologists; honorary member of the Royal Canadian Institute and of the Engineering Institute of Canada; member of the Committee on Reconstruction; Chairman of the Sub-Committee on the Development of Natural Resources and of the National Advisory Committee for Children from Overseas; president of the Association of Canadian Clubs, of the Ontario Research Council, of the National Conference of Canadian Universities, of the Royal Society of Canada.

Twenty universities gave him an honorary doctorate, among them Manitoba and Alberta; Toronto, Queen's, and McGill; Ottawa, Laval, and New Brunswick; Harvard, Queen's University of Belfast, Oxford, and Edinburgh.

As a man Dr. Wallace was unassuming and kindly. He kept his office door standing open all day as an invitation to enter. Early on Sunday mornings he visited students and staff who were sick and then went to church. The rest of the day he kept as his own for reading and writing. In composing his speeches he liked to sit in the dark piecing his thoughts together from the abundance of a full mind. In delivering them he spoke without notes in conversational tones made moving by simple sincerity.

Notwithstanding his humanity, no one got very close to him. "I have no friends," he once said, meaning only that as Principal he must aloofly avoid the very appearance of personal preferences. With fine reserve he kept his troubles and triumphs strictly to himself. He never showed annoyance when opposed. "If a man thinks I am wrong, I want him to tell me so," was his first request at Queen's. He was a leader, not a dictator. Still he usually got his way for he could be quietly firm.

Nowhere else is the essential Wallace so clearly revealed as in a short article written for *Queen's Quarterly*, which appeared only a few days before his death. It consists of memories and reflections with the title, "As I Look Back." He recalls the shaping influences of his youth in the Orkneys: the fine Scottish-Norwegian farming stock from which he came, with its application to work and respect for learning; and the almost unearthly changing beauty of the northern sea and sky and light, inducing a mysticism that never left him. "I am convinced," he wrote, "that is a better environment in which to grow up than the somewhat artificial atmosphere of a large city."

He records his debt to each of five teachers, two in particular: the headmaster of the county school, who gave him a love of science and a professor at Edinburgh who guided him into geology. The other three were his first teacher who had "the womanly qualities of gentleness and charm," an English master in high school who gave him "a love for the beauty of English prose," an Edinburgh philosopher "who practised the idealism which he professed, and a world famous savant at Göttingen who lived the ideal life of a man devoted to scientific research."

He is sure that good not evil is predominant in human nature and that praise is better than criticism as a spur to effort. He recognizes the problem

posed by today's mass education with great variety of capacity and interest in every classroom and a consequent lack of mental challenge to the few with exceptional minds. "As far as Canada is concerned, this is a transitional phase. It is important that young people should be educated to take an effective part in the life of the community, on the whole more important, at this stage, than that a relatively few should be trained. The able minds somehow find the means of carrying on. . . . It may be that the old time discipline of the classics and higher mathematics . . . will give place to other media of instruction. Whatever is used, there must be a challenge to the mind . . . when the people of Canada are convinced of the need, the way will be found."

He declares two fundamental beliefs:

First, that human progress exists, though it may seem to have reverses. "Since life began . . . there have been successive steps forward. . . . The process continues so slowly as not to be perceptible within the compass of a human lifetime. But it continues. . . . I have the firm conviction, which is to me an article of faith, that no conscious effort towards betterment is ever lost. It is held on the lap of time."

Second, he believed in a power ordaining ultimate good. "I feel that there is a mind beyond the visible processes, a fountainhead of all the love and beauty and goodness and truth, which we as human beings so imperfectly reflect. . . . We call that power God. . . . We reach out into the eternal. . . . This groping . . . may be too vague to put into the form of a dogma or a creed. That matters less. . . . What does matter is that the sense of the eternal informs our doing and our thinking . . . that we rest in the assurance that underneath are the everlasting arms. . . . On that basis only can life have a meaning which will satisfy us. It is on that basis that men and women, weary with the burdens they shoulder, find the strength to go on."

This man of high faith and good works had a fitting farewell. The funeral service was held in Grant Hall, a place of long memories. Though the day was bitterly cold, every seat was taken. The governing boards of the University, its students and staff, representatives of other universities and of learned societies, of church and state and the armed forces, many other Canadian leaders and many a humble person, came to honour one who had so greatly achieved. The printed order of service, prepared by the University Chaplain, had on its first page, standing alone, King David's lament: "Know ye not that there is a prince and a great man fallen this day in Israel"; and on the back page, standing alone, Bunyan's story of the last journey of Mr. Valiant-for-Truth, ending triumphantly, "So he passed over, and all the trumpets sounded for him on the other side."

The Chaplain's prayer began: "We thank Thee, O Lord our God, for this man of granite and grace, thy servant so highly revered and so greatly beloved among us."

W. E. McNEILL

APPENDIX C

TITLES AND ABSTRACTS OF PAPERS PRESENTED AT THE ANNUAL MEETING

PROGRAMME OF PAPERS

SECTION I. LITTÉRATURE, HISTOIRE, SCIENCES SOCIALES, ETC.

1. L'éducation dans le Bas-Canada. La loi des écoles de syndics (1829). Par Louis-Philippe Audet. Communication présentée par M. l'abbé Arthur Maheux, M.S.R.C.

Devant les insuccès des deux premières lois scolaires, celle de 1801 et celle de 1824, le Parlement du Bas-Canada adoptait, en 1829, une nouvelle législation que l'on peut considérer comme la base de notre système scolaire actuel. Deux amendements successifs, en 1830 et en 1831, permirent de donner à l'éducation populaire dans les campagnes un essor jamais connu jusqu'alors puisque les écoles passèrent rapidement de 325 à 1216.

Les principales caractéristiques de cette loi sont les suivantes : *son esprit démocratique*, les Syndics ou Commissaires d'écoles étant élus par les propriétaires fonciers, et *sa générosité*, puisqu'elle accordait des subventions pour la construction de l'école, pour le paiement des maîtres et pour l'instruction des enfants pauvres.

Bref, l'année 1829 doit être considérée comme le point de départ d'un réveil collectif sur l'importante question de l'éducation de la jeunesse.

2. Le Pensionnat de l'Hôpital-Général de Québec (1725–1868). Par Louis-Philippe Audet. Communication présentée par M. l'abbé Arthur Maheux, M.S.R.C.

En 1725, Mgr de Saint-Vallier autorisait les religieuses de l'Hôpital-Général de Québec à ajouter, au soin des malades, la direction d'un pensionnat.

L'institution connut une certaine vogue durant le régime français : les Actes capitulaires de la Communauté et les Annales établissent péremptoirement que le pensionnat fut tenu à partir de 1724.

Le *Journal du Pensionnat* (166 pages de texte) couvrant la période de 1835 à 1868, une liste de toutes les élèves de 1765 à 1868 et un album de découpures de journaux ou revues nous renseignent davantage sur les activités de cette maison d'éducation après la cession du Canada à l'Angleterre : qualité des élèves, programmes, règlements, examens publics.

3. De Cro-Magnon à Picasso. Par Jean Chauvin, M.S.R.C.

Essai sur l'évolution de la peinture pariétale des grottes préhistoriques et, plus particulièrement, de l'art franco-cantabrique de la France méridionale et de l'Espagne du Nord-Ouest où se retrouvent (20,000 ans avant notre ère) les éléments essentiels de la peinture contemporaine la plus avancée et la plus surréaliste.

4. De l'action du « Monde Bilingue » français-anglais et de ses répercussions sur la vie canadienne. Par Jean Désy, M.S.R.C.

Ambassadeur du Canada à Paris, M. Jean Désy est, avec M. Jean Berthoin, ministre de l'Education Nationale de France, et M. Edouard Herriot, président d'honneur de l'association du Monde Bilingue dont l'action nationale et internationale s'exerce déjà en France, en Angleterre, aux Etats-Unis et au Canada. Les buts, les mobiles et les moyens d'action d'une Communauté linguistique franco-anglaise.

Section I

5. La littérature française d'aujourd'hui. Par René Garneau, M.S.R.C.

Etude d'ensemble des milieux et des mouvements littéraires de la France de l'après-guerre et de l'esprit nouveau qui anime la littérature française actuelle. La synthèse d'une période littéraire brillante et complexe.

6. Crise politique et religieuse du Québec en 1775. Par Gustave Lanctôt, M.S.R.C.

La révolution des colonies américaines s'intègre dans l'histoire canadienne par sa campagne contre l'Acte du Québec et son invasion du pays. Grâce à une habile propagande et à des succès militaires, elle provoque, scindant en deux sa population, une double crise fondamentale, soulevant, en face d'une majorité loyaliste et obédientielle, une minorité anti-gouvernementale et anti-cléricale. Dans sa frénésie, cette minorité n'hésitera pas : elle ira jusqu'à la bataille contre la troupe et même jusqu'à l'arrestation des prêtres. Ses meneurs seront emprisonnés par l'Etat et excommuniés par l'Eglise. C'est au cours de cette crise, où faillit sombrer l'autonomie nationale, que le Canada français recevra, par le truchement des Américains, sa première leçon d'éducation politique et sociale.

7. Premiers principes d'une théorie de l'anglicisme. Par Jean-Marie Laurence, M.S.R.C.

Pour légiférer correctement en matière de linguistique, il faut quitter l'attitude fixiste pour adopter un point de vue dynamique et diachronique. C'est ainsi qu'on peut établir la légitimité de certains anglicismes, moyennant quelques règles très simples. Parmi les anglicismes acceptables, deux catégories méritent une attention particulière : les anglicismes *cénogènes*, c'est-à-dire les mots anglais et français qui ont une commune origine, et les *homotagmes*, c'est-à-dire les tours syntaxiques conformes à la syntagmatique de la langue emprunteuse. Tels sont les principes que tente de définer la présente communication.

8. Racine et Sophocle. Par Maurice Lebel, M.S.R.C.

L'attitude des historiens et des critiques littéraires concernant l'influence de Sophocle sur Racine. Les lectures de Racine. Sa formation d'helléniste à Port-Royal. Sa bibliothèque personnelle. Ses notes marginales et ses commentaires. L'attitude de Racine à l'égard d'Eschyle, de Sophocle et d'Euripide. Les éditions de Sophocle. Le goût prononcé de Racine pour Sophocle attesté par quelques contemporains. Les Préfaces des tragédies. Qu'est-ce que Racine doit à Sophocle ? Il est le Sophocle de la France.

9. La paix et la guerre, deux fruits de l'éducation. Par Eugène L'Heureux, M.S.R.C.

Illogisme universel : l'Humanité veut la paix entre les peuples, entre les classes et entre les races; mais elle se conduit de manière à vivre toujours en guerre dans ces trois domaines parce que, dans l'ensemble, elle a reçu et reçoit encore, au foyer, à l'école et dans le cours de la vie, une éducation orientée vers la guerre. C'est dans les esprits et les cœurs qu'il faut déposer le germe de la paix. Souhaitons que tous les éducateurs du monde enseignent avec plus de précision la justice, la charité chrétienne et la doctrine pacificatrice de l'Unesco. Une commission canadienne de l'Unesco est nécessaire.

10. Le vocabulaire du Canada français. Par Léon Lorrain, M.S.R.C.

Le vocabulaire du Canada français est complexe. Aux mots d'usage courant en France

s'ajoutent des archaïsmes, dont plusieurs sont devenus des anglicismes et des américanismes. L'étude de l'ancien français nous permettrait de mieux pénétrer le sens de vieilles locutions survivantes et même de ressusciter certains termes pittoresques.

11. Les mathématiques de nos ancêtres. Par Léon Lortie, M.S.R.C.

Dès sa fondation, le Collège des Jésuites de Québec enseigna les mathématiques et il eut bientôt une chaire royale d'hydrographie. Le Séminaire de Québec continua cette tradition. L'auteur décrit les premiers manuels d'arithmétique et de mathématiques publiés au Canada par des Canadiens de langue française, du début jusqu'au milieu du XIXe siècle.

12. Une visite chez les Aïnos du Japon. Par Claude Mélançon, M.S.R.C.

Une tribu asiatique primitive du Japon en voie de disparition chez qui se retrouvent des coutumes similaires à celles observées dans certaines tribus amérindiennes de l'Amérique du Nord. L'auteur rentre d'un voyage au Japon où il a étudié sur place les mœurs curieuses de ces primitifs cantonnés dans une réserve de Hakkaido, une des trois îles principales qui constituent le Japon.

13. Le devoir des parents et des éducateurs dans la guerre à l'alcoolisme. Par Adrien Plouffe, M.S.R.C.

A la lumière des dernières études et recherches en médecine préventive, en psychiatrie, en pathologie et en pédagogie, la coopération des parents et des éducateurs avec les gardiens de la santé publique est essentielle au succès de toute campagne entreprise contre la plaie individuelle, familiale et sociale de l'alcoolisme.

14. La présence du bon sens est nécessaire à l'art de vivre. Par Adrien Plouffe, M.S.R.C.

Nous vivons à une époque où nul n'est content de son sort. La vie simple et éclairée par le bon sens, telle que la pratiquaient nos arrière-grands-parents, est devenue une machine aux rouages trop compliqués. Pour retrouver la sérénité d'antan, l'homme doit réapprendre à penser et reprendre le chemin du gros bon sens.

15. Né à Montréal. Par Mgr Olivier Maurault, M.S.R.C.

La Nouvelle-Orléans vient d'élever un monument à son fondateur, Jean-Baptiste LeMoyne de Bienville; Bienville, un des Macchabées de la Nouvelle-France, est né à Montréal en 1860 et a fondé la Nouvelle-Orléans en 1717. Il a été gouverneur de la Louisiane pendant une quarantaine d'années. L'auteur a assisté au dévoilement du monument en avril dernier, et raconte ce qu'il a vu et entendu à cette occasion.

16. Le peintre Joseph Légaré (1795-1855). Par Gérard Morisset, M.S.R.C.

A l'occasion du centenaire de la mort de Joseph Légaré, l'auteur rappelle quelques épisodes de la vie de cet artiste et apporte quelques faits nouveaux à sa participation aux troubles de 1837. Il passe ensuite en revue son œuvre qui se divise en deux parties bien distinctes : des peintures religieuses d'un style assex lourd et des tableax d'histoire d'un style alerte et parfois primitif.

SECTION II. ENGLISH LITERATURE, PHILOSOPHY, SOCIAL SCIENCES, ETC.

Monday, June 6

10.00 A.M.—General Meeting of the Society.

11.00 A.M.—Presidential Address: The Threat of Over-Population. By D. A. MacGibbon, F.R.S.C.

A survey of present trends in world population with special reference to the dilemma of falling death rates arising from the extension of aid to under-developed countries.

2.00 P.M.

1. Business Meeting.

2. General Session

(1) The Implications of United States Policy for the Canadian Wheat Economy. By G. E. Britnell, F.R.S.C.

This paper examines the present position of the prairie wheat economy and the future prospects for Canadian wheat in the markets of the free world. An attempt is made to analyse the implications for Canada of United States domestic and foreign economic policies as reflected in agricultural price stabilization programmes, export subventions, import quotas, and surplus disposal legislation. What are the probable economic, social, and political consequences for the Prairie Provinces and for Canada of failure to ride out this economic blizzard? What policies of production and marketing, trade and tariffs, should Canada pursue to ease the strains of subsidized competition in world markets?

(2) The Bias of Prairie Politics. By W. L. Morton. Presented by D. G. Creighton, F.R.S.C.

The general belief that the politics, both federal and provincial, of the three Prairie Provinces have been different from the politics of central and maritime Canada has some substance. Prairie politics have been comparatively volatile in spirit and unorthodox in expression, and jealous of control by Ottawa or a national party organization. These differences, however, were not fundamental. They were not caused by opposition to Canadian institutions or to membership in Confederation. They arose out of certain local peculiarities, the strong *métis* community of Red River, for example, or the painful incidence of certain national policies, such as the tariff on agricultural machinery. An initial bias, however, became an established tradition after 1921; without apparent injury to national unity, however, because the prairie West has always hoped to re-make the nation in its own image.

Tuesday, June 7

9.00 A.M.

1. Social Science Session

(1) The Ideological Origins of Anglo-Saxon Conservatism in Canada. By D. C. Masters, F.R.S.C.

The mainspring of organized Anglo-Saxon Conservatism was the urge to political and economic dominance. Yet its outward manifestation took the form of a whole series of beliefs and antipathies. The purpose of this article is to describe the nature, origin, and, to some extent, the history of these beliefs and antipathies. In large measure they were derived from Europe; to some extent they were indigenous. They were the product of conditions which have largely disappeared. The result has been a decline in Conservatism.

(2) Britain's Withdrawal from North America 1864–1871. By C. P. Stacey, F.R.S.C.

Historians of British foreign policy have taken little notice of the embarrassments resulting from the fact that the menacing developments in Europe in the years 1864–1871 coincided with a serious crisis in Anglo-American relations. Britain in fact apprehended a war on two fronts, one on each side of the Atlantic. Her remedy, never quite fully avowed, was to abandon her military and political responsibilities in North America. Encouragement of Canadian Confederation was one aspect of this policy, which was symbolized by the withdrawal of British troops from the fortress of Quebec.

2. Literature Session

(1) The Epic Poetry of Mickiewicz. By Watson Kirkconnell, F.R.S.C.

The chief epic in any Slavonic language is *Pan Tadeusz* by the Polish poet, Adam Mickiewicz. The centennial of his death in 1855 provides the occasion for an assessment of his enduring greatness.

(2) Louise Labé: The Sappho of the Renaissance. By Skuli Johnson, F.R.S.C.

Precisely four hundred years ago (1555), Louise Labé of the Lyons school of poetry published her works, consisting of a Debate (in prose) between Love and Folly, three elegies, and twenty-four love sonnets. The last-named established Louise Labé as the Sappho of the French Renaissance, being the expression of genuine passion for the poet Olivier de Magny. Louise Labé was, though devoid of Greek, an accomplished linguist; one of her sonnets is in Italian, and another is a version of an Italian one. In the history of the sonnet in France, these poems occupy a pioneering and honoured place. Translations of these sonnets by the present writer are submitted; likewise, there is included a translation of one of the elegies which readily ranks with the best in this literary genre.

(3) Some Problems of the *Medea*. By R. E. K. Pemberton. Presented by J. J. Talman, F.R.S.C.

This paper attempts a partly new interpretation with special reference to such topics as the credibility of Medea, the character of Jason, and the position and attitude of the Chorus.

2.00 P.M.—Symposium—"A. J. Toynbee and the Philosophy of History."

(1) Professor Toynbee and the Processes of Cultural Change. By A. G. Bailey, F.R.S.C.

Section II

Dr. Toynbee's examination of the social contexts of apogees in the fine arts is appraised, especially his treatment of the climax and subsequent decline of Athenian culture following the moment of "breakdown". His treatment of the problem of florescence and decline is considered in the light of the findings of cultural anthropologists covering the clusterings of genius, the logical development of style patterns, and the concordant economic, political, and intellectual processes. Dr. Toynbee's methods and conclusions are compared with those of Galton, Sorokin, Kroeber and others, and an attempt is made to point the way in which future investigations might profitably be pursued.

(2) Time, Myth and Fact. By A. R. M. Lower, F.R.S.C.

Time is the especial property of the historian. Time is also one of the major aspects of our idea of the cosmos. Our man-made time scales colour our whole scheme of things. Time for us is related to human events, or to human events to which religious, that is "eternal" significance is given. But the vast extensions given to time by other disciplines entirely change our historical relationships to our fellows, to our world, and to religion. These extensions lie outside the province of the historian, whose preoccupation must always be with the moving, or dynamic, human group, that is with civilized man.

The historian must deal with the facts about civilized man. But his facts must necessarily be coloured by his preconceptions and his associations. In this way, the historian will always lie under the spell of the "myth": in fact, his work will have value and force only as it is in some way associated with the "myth." The ideal historian is faithful to the fact and moved by the myth.

Arnold Toynbee, since he has no relation to any conceivable "myth," is not a historian. His subject is not humanity but "social laws."

The myth goes on from conceptions of time to world views, that is, to systems of philosophy and religion. Within one or another of these most of mankind lives: attempts to explain or perpetuate them constitute a good share of the field of scholarship, history included. The paper illustrates this in various ways.

(3) The Later Phases of Toynbee's Work. By F. H. Underhill, F.R.S.C.

A review of Toynbee's views as developed in the last four volumes of his *Study of History*.

Wednesday, June 8

9.00 A.M.

1. Social Science Session

(1) The Constitutional Framework of Taxation Agreements. By F. R. Scott, F.R.S.C.

New taxation agreements between federal and provincial Governments are now contemplated. This paper sets out the basic rules regarding powers of taxation to be found in the B.N.A. Act, and discusses the legal effects of taxation agreements upon provincial autonomy. An attempt will be made to assess some of the intangible factors that affect the operation of legal rules in this area.

(2) Post-War Changes in Government Attitudes towards Immigration. By Mabel F. Timlin, F.R.S.C.

The post-war period has seen a considerable amelioration of restrictions on immigration. The Immigration Act of 1952 gives greatly increased discretion to the Minister and has reduced the necessity for special orders-in-council. Rapid changes in short-run policy are now possible. But security and other conditions have made administrative problems much more complicated and have bearing on human rights. It is a sociological axiom that the strength of democracies lies in their power to adopt totalitarian methods in the face of danger and reverse the process when danger passes. But chronic danger may bring special threats to hard-won liberties.

(3) Changing Values and the Birth-Rate. By Nathan Keyfitz. Presented by S. D. Clark, F.R.S.C.

Students of population can make predictions of population numbers and compare these with subsequent counts; failure of such predictions is useful in bringing out the fact that incomplete predictive schemes have been employed. There have been enough failures of population projections in recent years to suggest that any self-contained numerical system, however ingenious, leaves out essential elements. Awareness of the effect of cultural and psychological factors is leading students to examine these wider aspects of conduct in attempting to make hypotheses and predictions on what will happen to the birth-rate. The present paper seeks from statistical data an answer to the question of whether a major shift in family values has taken place in Canada within this generation, and what its consequences are likely to be for our future growth.

2. Literature Session

(1) The Challenge of Modern English Prose. By Hugh MacLennan, F.R.S.C.

During the last three centuries, writers of English prose have made three separate attempts to increase the scope and expressive power of the English language.

The first was the attempt of Dryden and his followers to liberate the prose medium from the confusion and prolixity of the Jacobeans. The second, an offshoot of the Romantic movement, was the effort made by nineteenth-century novelists to write more informally (for a rising middle class) and to use richer textures. The third, mainly associated with the so-called experimental writers of the twentieth century, was the attempt to revive a medium which seemed either threadbare or crushed under the weight of *clichés*. Now in the middle of the twentieth century the writers of prose face still another challenge—how, while remaining human and intimate, can they on the one hand compete with motion pictures and television and on the other absorb the new knowledge and the new vocabulary derived from psychology and the social sciences?

(2) The Unpublished Novels of Frederick Philip Grove. By W. E. Collin, F.R.S.C.

At his death Frederick Philip Grove left six or seven novels, some completed, some unfinished. These manuscripts are precious because they show us how Grove solved his inner problems. They reveal, too, an understanding of human life we might call Grovian, the basis of which is the idea of a correspondence between the human and the cosmic. Eventually, tragedy and religion became one and the same experience with Grove; he saw life as a ritual involving sacrifice and death.

Section II

(3) "Forests and Woods" in Great Britain. By Frank Gilbert Roe. Presented by F. M. Salter, F.R.S.C.

This paper examines the validity of the earlier identification of the ancient "Forests" of Great Britain (comprising for the present purpose England, Wales, and Scotland) with woodland growth. Although the term *forest* does not in itself bear any glossic interpretation as *wood* (being in fact a legal definition and not an ecological etymon of any character) documented evidence here cited from legal, historical, etymological, ecological, and contemporary sources, and also from the mediaeval Forest records, indicates that the older view of earlier Britain as "a land of woods" is much sounder than many scholars have been inclined to believe; and must be given more serious critical consideration.

2.00 P.M.—Business Meeting.

3.00 P.M.—General Meeting of the Society.

SECTION III. CHEMICAL, MATHEMATICAL AND PHYSICAL SCIENCES

Summary of Programme

Monday, June 6

11.00 A.M. General Meeting of Section, Room 135, McLennan Laboratory.
2.00 P.M. Presidential Address and invited papers, Room 135, McLennan Laboratory.

Tuesday, June 7. Sub-section meetings as follows:

9.00 A.M. Mathematics—Room 101, McLennan Laboratory.
9.00 A.M. Nuclear Physics—Room 135, McLennan Laboratory.
9.00 A.M. Chemistry—Room 132, McLennan Laboratory.
9.00 A.M. Meteorology—Room 106, McLennan Laboratory.

2.00 P.M. Mathematics—Room 101, McLennan Laboratory.
2.00 P.M. Metal Physics—Room 106, McLennan Laboratory.
2.00 P.M. Spectroscopy—Room 132, McLennan Laboratory.
2.00 P.M. General Physics—Room 135, McLennan Laboratory.

Wednesday, June 8. Sub-section meetings as follows:

9.00 A.M. Geophysics, joint session with Section IV.
9.00 A.M. Chemistry—Room 132, McLennan Laboratory.
9.00 A.M. Astrophysics—Room 106, McLennan Laboratory.
9.00 A.M. General Physics—Room 135, McLennan Laboratory.
11.00 A.M. Business Meeting of Section—Room 135, McLennan Laboratory.

Monday, June 6

11.00 a.m.—Business Meeting of Section—Room 135, McLennan Laboratory.

2.00 p.m.—Presidential Address and invited lectures—Room 135, McLennan Laboratory.

1. The Spectroscopic Method of Measuring Distances of the High Temperature Stars. R. M. Petrie, F.R.S.C.
2. Interstellar Absorption Lines as Distance Indicators for Remote Stars. C. S. Beals, F.R.S.C.
3. Galactic Structure in the Sun's Vicinity as Revealed by the Distribution of High-Temperature Stars. D. A. MacRae.

Tuesday, June 7

9.00 a.m.—Sub-section MATHEMATICS—Room 101, McLennan Laboratory. PAPERS 4–13.

4. On the Coordinatization Theorem of J. von Neumann. By K. D. Fryer and Israel Halperin, F.R.S.C.

A precise statement of the von Neumann theorem is as follows. Let L be a complemented modular lattice possessing a homogeneous basis $a_1, \ldots, a_n$, $n \geqslant 4$, and let L_{12} be the set of all inverses of a_2 with respect to $a_1 + a_2$. Then (i), addition and multiplication can be defined for the elements of L_{12} in such a way that L_{12} becomes a regular ring $\mathfrak{R}$ and the sublattice $L(a_1)$, consisting of all $x \leqslant a_1$, is isomorphic to the lattice of all left principal ideals of $\mathfrak{R}$, and (ii), L is lattice-isomorphic to (coordinatized by) the lattice of all left principal ideals of $\mathfrak{R}_n$. Here $\mathfrak{R}_n$ consists of all $n \times n$ matrices with elements in $\mathfrak{R}$ and, as shown by von Neumann, is regular along with $\mathfrak{R}$.

5. Matrices Poorly Behaved with Respect to Approximation of their Inverses. By N. S. Mendelsohn. Presented by R. L. Jeffery, F.R.S.C.

The following theorem is proved. Let ϵ and K be real positive numbers. For each $n \geqslant r$, there exist $n \times n$ matrices A and X whose entries are all real and whose determinants are non-vanishing, such that every entry of XA differs from the corresponding entry of the identity matrix by less than ϵ and such that every entry of AX is larger than K. A connection between ϵ, K and the separation of the characteristic values of A is obtained.

6. Unit Changes in Order-Bases at a Point and Their Associated Fundamental Exponents. By S. Beatty, F.R.S.C.

Beginning with an order-basis at a point and the associated function-basis, taken in normalized form, and raising the order-basis for a single cycle by unity, it is shown how to arrive at the resulting associated function-basis, likewise in normalized form, thus indicating which one of the fundamental exponents is depressed by unity. This is extended to cover the case where the order-basis for a single cycle is depressed by unity, with the result that one of the associated fundamental exponents is raised by unity. Passing from any order-basis to another implies, therefore, a succession of unit changes in the associated fundamental exponents, depending on the sequence adopted.

7. On the Modular Representations of the Symmetric Group. V. By G. de B. Robinson, F.R.S.C.

It has been observed that the number of p-regular classes of S_n, i.e., the number of classes of order prime to p, is equal to the number of partitions of n in which no summand is repeated p or more times. It seems natural to call the Young diagram $[\lambda]$ associated with such a partition *p-regular*, otherwise *p-singular*. The problem considered here is that of refining the above result to prove that the number of regular diagrams in a given block is equal to the number of modular irreducible representations in that block.

8. On the Neumann Problem of Generalized Potential Theory. By G. F. D. Duff. Presented by G. de B. Robinson, F.R.S.C.

This theory applies to harmonic differential forms ϕ of degree p on a compact domain D of a Riemannian V_n. The governing partial differential equation if $\nabla\phi = 0$ and the $\binom{N}{p}$ boundary conditions are given values for $t\delta\phi$ and $nd\phi$. Since there exist infinitely many linearly independent eigenforms τ with $d\tau = 0$, $\delta\tau = 0$, there are infinitely many integral constraints on the data. It is shown that these imply $\binom{N-1}{p-1}$ pointwise differential constraints.

9. Convex Functions of Order n. By R. D. James, F.R.S.C.

A function whose divided differences of order n are all non-negative may be called a convex function of order n. In this notation, an ordinary convex function is of order 2. It is shown that a function $F(x)$ which is continuous and convex of order n has generalized differential coefficients $F_{(k)}(x)$ for $1 \leqslant k \leqslant n-2$. In addition $F(x)$ has right- and left-hand generalized differential coefficients of order $n-1$ and each is monotone non-decreasing. These properties may be used to show that the generalized nth primitive of a function has similar differentiability properties.

10. Asymptotic Formula for the Bell Numbers. By Leo Moser and Max Wyman, F.R.S.C.

Properties of the Bell numbers G_n, defined by

$$e^{e^x-1} = \sum_{n=0} G_n x^n/n!$$

have been studied by many authors. However, only L. F. Epstein (J. Math. and Phys. *18* 1939: 166–182) has given a formula for the asymptotic behaviour of G_n. His method is rather long and yields only the first term of the asymptotic formula. Moreover, his final result contains an error. In the present paper it is shown by an entirely different method that

$$G_n \backsim (R+1)^{-\frac{1}{2}} e^{n(R+R^{-1}-1)}$$

where R is the real solution of $Re^R = n$. Furthermore, the complete asymptotic expansion of G_n is obtained.

11. On a Theorem of van der Waerden. By Leo Moser. Presented by Max Wyman, F.R.S.C.

A well-known theorem of van der Waerden ensures that, given any positive integers k and l, there is a positive integer m such that in any distribution of the numbers $1, 2, \ldots m$ into k classes, at least one class will contain an arithmetic progression of length l. Let $W(k, l)$ be the least value of such a number m. A lower bound for $W(k, l)$ is obtained which for some values of k and l is better than that obtained by Erdös and Rado (Proc. Lond. Math. Soc. *3*, 1952: 417–439). For $l = 3$ an upper bound is obtained. Some distributions of the integers into two classes, neither of which contains an infinite arithmetic progression, are constructed. These have some additional properties and generalize a result of Zarankiewitcz (W. Sierpinski, Colloquium Math. *3* 1954: 44–49).

12. A Generalization of Some Theorems of Hardy. By P. G. Rooney. Presented by Max Wyman, F.R.S.C.

Hardy has shown that if $\phi \in Lp\ (0, \infty)$, and

$$\xi(x) = \frac{1}{x}\int_0^x \phi(t)\, dt,$$

and

$$\eta(x) = \int_x^\infty \frac{\phi(t)}{t}\, dt,$$

then $\xi \in Lp\ (0, \infty)$ for $1 < p \leqslant \infty$, $\eta \in Lp\ (0, \infty)$ for $1 \leqslant p < \infty$. The spaces $Lp\ (0, \infty)$ have been generalized by Lorentz to spaces $\Lambda(\alpha, p)$, $0 < \alpha < 1$, $1 \leqslant p \infty$. Connected with

these spaces are spaces $M(\alpha, p)$. We have generalized Hardy's results to $\Lambda(\alpha, p)$ and $M(\alpha, p)$. We make an application of these results to the study of Laplace integrals.

13. On a Theorem of Frobenius-König and J. von Neumann's Game of Hide and Seek. By Lloyd Dulmage and Israel Halperin, F.R.S.C.

J. von Neumann has introduced a game in which player I (the hider) selects one of the places in an $n \times n$ matrix of positive real α_{ij} and player II (the seeker) selects a row or column of the matrix. If the seeker finds the hider in the row or column, he receives α_{ij}. Otherwise he receives zero. In his discussion of this game, von Neumann proved a theorem which is equivalent to a theorem of G. Frobenius and D. König. The purpose of this note is to explore more fully the connection between this theorem and the game.

9.00 a.m.—Sub-section NUCLEAR PHYSICS—Room 135, McLennan Laboratory. PAPERS 14–29.

14. The Conversion Electron Spectrum of Eu^{152-4}. By D. C. Milley and K. C. Mann. Presented by G. M. Volkoff, F.R.S.C.

The conversion electron spectrum of a thin Eu^{152-4} source has been studied in a modified thin-lens spectrometer, using ring-focus collection. The results show the presence of conversion lines belonging to transitions of energies of 124, 246, 342, and 402 kev. The complex beta spectrum has been analysed and will be discussed.

15. The Disintegration of Se^{75}. By G. W. McMahon and K. C. Mann. Presented by G. M. Volkoff, F.R.S.C.

The conversion and gamma-spectrum of Se^{75} has been examined in an unmodified thin-lens spectrometer. The photoelectron distribution from a uranium converter shows gamma-rays of energy 97, 121, 137, 265, 280, 303, 328, and 400 kev. The conversion spectrum indicates conversion of the above plus a 66 and 148 kev. transition. There are no primary beta particles. Relative intensities and conversion coefficients have been measured and will be discussed.

16. Capture Radiation from Li^6 (p, γ) Be^7. By J. B. Warren and T. K. Alexander. Presented by G. M. Shrum, F.R.S.C.

Targets of separated Li^6 isotope have been bombarded with protons and the resulting feeble gamma radiation analysed with a scintillation counter. The spectrum showed 430 kev. radiation arising from B^{10} $(p, \alpha)Be^7$ and fluorine radiation. By working at suitable bombarding energies 6 Mev. components were distinguished which varied in energy with proton energy as expected for Li^6 capture radiation. About 70 per cent of the capture radiation leads to the ground state and 30 per cent to the 430 kev. state of Be^7. Both components have similar roughly isotropic distribution. The total cross-section for capture is $\sim 2\ 10^{-31}$ sq. cm.

17. The Excited States of Os^{188}. By M. W. Johns, I. R. Williams, and C. C. McMullen. Presented by H. E. Duckworth, F.R.S.C.

The beta-ray and gamma-ray spectra of Re^{188} have been examined by C. C. McMullen using a high resolution beta-ray spectrometer. A preliminary report of this work was given

to the Royal Society in 1953. Recently two sodium iodide scintillation gamma-ray spectrometers have been used to study gamma-gamma coincidences between the radiations observed. These experiments show that the strong 155 kev. radiation is in coincidence with the 453, 478, 828, 931, 1133, 1307, 1609, 1782, and 1801 kev. gamma rays. The 633 kev. radiation is in coincidence with the 453, 828, 1133, and 1307 kev. gramma rays. The 1956 kev. transition is not in coincidence with any other radiations.

Both the beta-ray spectrometer and coincidence experiments give strong support to a decay scheme involving states in Os^{188} at 0 (0+), 155 (2+), 633 (2+) 1086, 1461, 1759, 1765, and 1956 kev. The spins and parities of the low-lying states have been established by internal conversion measurements.

18. Analysis of the Interference between Two $J = \frac{1}{2}+$ States in the Reaction $C^{14}(p, \gamma_0)N^{15}$. By A. J. Ferguson, G. A. Bartholomew, H. E. Gove, A. E. Litherland, and E. B. Paul. Presented by L. G. Elliott, F.R.S.C.

The two interfering levels in N^{15} of $J = \frac{1}{2}+$ studied by Bartholomew *et al.* (Phys. Rev. *96*, 1954: 1154) in the reaction $C^{14}(p, \gamma_0)N^{15}$ have been fitted by a seven parameter expression of the form

$$y = \frac{P}{E}\left|\frac{N}{E - E_N - i\Gamma_{N/2}} + e^{-i\phi}\,\frac{B}{E - E_B - iP\Gamma_{B/2}}\right|^2$$

using the FERUT computer. The sum of the squares of the deviations was minimized by successive approximations. The symbols N, E_N, and P_N denote amplitude, centre of mass resonance energy, and width in Mev. respectively for the narrow resonance with similar quantities for the broad resonance. P is the s-wave proton penetrability and ϕ is the phase difference between incoming s-waves for the two resonances. The following values in centre of mass coordinates were obtained: $\phi = -48.4$ degrees, $P\Gamma_B = 0.446$, $E_B = 1.412$, $\Gamma_N = 0.0384$, $E_N = 1.234$, $B = 19.05$, $N = 0.768$. The results will be compared to the theoretical two-level formula of Wigner (Phys. Rev. *70*, 1946: 606).

19. The Interaction in the Beta Decay of the Neutron. By J. M. Robson. Presented by L. G. Elliott, F.R.S.C.

The coefficient α in the angular correlation factor

$$\left(1 + \alpha\frac{v}{c}\cos\phi_{e\nu}\right)$$

is being obtained for the beta decay of the neutron, by measuring the momentum spectrum of those electrons which are emitted at $160° \pm 10°$ from the recoil direction of the proton. The result of data taken up to the date of this abstract is $\alpha = +0.10$ with a standard deviation of ± 0.19. This result is consistent with a mixture of scalar and tensor interactions, and gives the fraction of the tensor interaction as $x = 0.61$ with standard deviations of $+0.30$ and -0.19.

20. Geometrical Correction to the Bragg-Gray Relation and the Absolute Yield of the Ferrous Sulphate Radiation Dosimeter. By P. J. Dyne. Presented by G. C. Laurence.

The γ-ray irradiation conditions for the valid application of the Bragg-Gray relation, which relates the energy deposition in a solid to the ionization in an air-filled cavity, are

examined with reference to some published experiments on the yield of the radiation-induced oxidation of ferrous sulphate. Experiments in which divergent radiation is used will give erroneous results. A quantitative treatment is described which accounts for the discrepancies between certain experimental results.

21. Detection of Heavy Mesons in Photographic Emulsions. By E. Pickup. Presented by D. C. Rose, F.R.S.C.

The different types of particles with masses intermediate between those of the pi meson and proton and with masses somewhat greater than the proton mass, and the means of identifying such particles will be discussed. Particular reference will be made to the recent experimental work in this connection by the author and collaborators.

22. New Measurements of the Geomagnetic Effect on Cosmic Rays. By D. C. Rose, F.R.S.C., and John Katzman.

During the 1954 cruise of H.M.C.S. *Labrador* through the North West Passage and circumnavigating the North American continent, cosmic ray measurements were taken continuously. The geomagnetic latitude range covered was from 18°N to 89°N. Both the nucleon component and the hard or meson component were studied using a neutron monitor and a triple coincidence Geiger counter telescope. The results showed that the so-called latitude knee in the case of the nucleon component occurred at about 52°N geomagnetic latitude. In the case of the meson component, the position of the knee was more difficult to determine accurately because of temperature effects. The intensities on the east and west sides of the continent were appreciably different showing the longitude effect due to the eccentric position of the dipole representing the earth's magnetic field. Meteorological corrections will be discussed.

23. On Dipole-Dipole Interactions in R.F. Nuclear Resonance Spectra. By G. M. Volkoff, F.R.S.C.

The dipole-dipole interaction of nuclei of spin $I = 3/2$ is examined theoretically as a possible cause of observed small additional line splitting in the B^{11} radio-frequency spectrum of kernite which shows pronounced quadrupole splitting of nuclear magnetic resonance lines.

24. Level Scheme of Pt^{198}. By G. T. Ewan. Presented by J. S. Foster, F.R.S.C.

Coincidence techniques have been used to establish a possible level scheme for Pt^{198} following the decay of Au^{198}. Twenty-one γ-rays, all below 500 kev., have been observed associated with this decay. The first excited state of Pt^{198} is at 12.6 kev. and its measured half-life is $(2.3 \pm 0.8) \times 10^{-9}$ sec. Apart from a single M4 transition of 135.4 kev., all others are M1, E2 or mixtures of these so that the M4 represents the only change of parity. The marked similarity between this level scheme and those of neighbouring odd neutron isotopes will be discussed.

25. Calculations of Spallation Yields in Heavy Elements. By J. David Jackson. Presented by J. S. Foster, F.R.S.C. (Assisted by Atomic Energy of Canada Ltd.)

Proton- and neutron-induced spallation yields have been evaluated using the Chalk River Monte Carlo calculations of the prompt cascade along with evaporation theory for

the subsequent de-excitation of the residual nucleus. Charged particle evaporation was neglected; consequently the results apply only to heavy elements. For 400 Mev. protons incident, approximately 1.2 ± 0.6 protons and 7 ± 5 neutrons are emitted. The first number in each case is the mean value; the second gives a rough measure of the spread around the mean. Comparison with experimental data for high energy protons on bismuth and tantalum yields qualitative agreement.

26. Cross-sections of (p, xn) Reactions in Heavy Elements. By R. E. Bell and H. M. Skarsgard. Presented by J. S. Foster, F.R.S.C.

Cross-sections have been measured by the activation method for (p, xn) reactions in Pb^{206} and Bi^{209}, with x ranging from 1 to 7. The targets were bombarded in the internal beam of the McGill cyclotron at energies from 15 to 75 Mev. The cross-sections plotted against energy form a series of broad peaks corresponding to successive values of x, each of height $\backsim$1 barn. The results agree with a theory involving direct knock-out plus neutron evaporation, except that the $(p, 2n)$ peaks are relatively high; this may be evidence for the nuclear size effects proposed by Weisskopf *et al.*

27. The Preparation of Radioactive Sources at the Radiation Laboratory, McGill University. By A. L. Thompson. Presented by J. S. Foster, F.R.S.C.

Details will be presented on the preparation of spectrometer sources of carrier-free neutron deficient isotopes of mercury, gold, and platinum by freezing, absorption, and extraction techniques. The preparation of nearly carrier-free sources of lanthanum, cerium, praseodymium, and thallium will be discussed.

28. A New Scandium Isotope of Mass 42. By J. A. R. Cloutier, A. Henrikson, L. Yaffe, and J. S. Foster, F.R.S.C.

A missing member, Sc^{42}, of the odd-odd $Z = N$ family has been observed by proton bombardment of a Ca target enriched to 60 per cent in Ca^{42}. The half-life is 0.69 ± 0.03 sec. β^+ particles with an end point energy of $\backsim$5 Mev. have been observed with a scintillation counter using a stilbene crystal and feeding a 28 channel kick-sorter. No γ-ray could be detected. Further work is in progress and will be reported.

29. Short-lived Isomeric Transitions in Ba, La, and Ir. By J. A. R. Cloutier, A. Henrikson, and J. S. Foster, F.R.S.C.

γ-rays of 0.80 ± 0.02 Mev. and 1.05 ± 0.04 Mev. with a half-life of 0.32 ± 0.02 sec. have been observed following bombardment of Ba with protons. Threshold measurements indicate that Ba^{134} is responsible.

An activity of 0.14 ± 0.02 sec. half-life related to a 90 ± 5 kev. γ-ray has been observed from Ba and La targets. This is assigned to La^{138-6}.

Ir^{191m} has been investigated and a half-life of 4.53 ± 0.18 sec. has been measured. The γ-ray spectrum reveals lines at 126 ± 6 kev., 64 kev. (Ir K X-ray) and $33.\pm3$ kev. (probably escape peak).

9.00 a.m. Sub-section CHEMISTRY—Room 132, McLennan Laboratory. PAPERS 30–40.

30. The Reaction between Active Nitrogen and Azomethane. By D. Armstrong and C. A. Winkler, F.R.S.C.

The reaction between active nitrogen and azomethane produced hydrogen cyanide together with smaller amounts of ethane and traces of ethylene and acetylene. For low concentrations of active nitrogen constant maximum yields of hydrogen cyanide and of ethane were attained at all temperatures as the azomethane flow rate was increased. The maximum hydrogen cyanide production then corresponded to complete consumption of the active nitrogen. The relative amounts of ethane and hydrogen cyanide produced at different temperatures indicated a low activation energy for the reaction between active nitrogen and methyl radicals.

31. The Reaction of Active Nitrogen with Methylamine. By G. R. Freeman and C. A. Winkler, F.R.S.C.

Active nitrogen reacted with methylamine to produce hydrogen cyanide, hydrogen, and a polymer, with smaller quantities of ammonia and C_2 hydrocarbons. The rates of methylamine destruction and hydrogen cyanide production increased with increasing temperature, while polymer formation increased with decreasing temperature. Comparison of the maximum rates of hydrogen cyanide production from methylamine and from ethylene during reaction with active nitrogen indicates that methylamine undergoes both ammonia and hydrocarbon type reactions.

32. The Reaction of Methyl Cyanide with Active Nitrogen. By W. Forst and C. A. Winkler, F.R.S.C.

The reaction of methyl cyanide with active nitrogen has been studied in the temperature range 70–450°C. The main product was hydrogen cyanide together with smaller amounts of hydrogen, cyanogen, methylisonitrile, and acetylene. Significant amounts of ethane, methane, and ethylene were found only at temperatures higher than 250°. The manner in which hydrogen cyanide production depends upon initial concentration of methyl cyanide at all temperatures seems to indicate that methyl cyanide acts as an efficient third body in the deactivation of active nitrogen.

33. Mercury Photosensitized Decomposition of Ethylene Oxide. By R. J. Cvetanović. Presented by I. E. Puddington, F.R.S.C.

Mercury sensitized decomposition of ethylene oxide has been partly reinvestigated and advantage has been taken of greater analytical facilities available at present in order to obtain a more detailed picture of the reaction products than was possible in previous investigations. Decomposition of ethylene oxide in the presence of ethylene and butene-1 has also been studied. The very pronounced changes in the relative amounts of different products formed when a small quantity of one of these compounds is added to ethylene oxide appear to throw considerable light on the mechanism of the decomposition and the nature of free radicals involved in the process.

34. New Methods of Dimensional Stabilization of Wood. By D. Arseneau and J. Risi, F.R.S.C.

Swelling and shrinkage of wood result mostly from the relationship of water and hydroxyl groups in wood cellulose and lignin. The fixation of these groups by chemical reactions would therefore be expected to increase the dimensional stability of wood. Stamm has studied vapour phase acetylation catalysed by pyridine, thereby obtaining an antishrink efficiency up to 70 per cent. The authors studied vapour phase acetylation catalysed by dimethyl-

formamide, as well as allylation, butylation, and phthaloylation of wood under various conditions. Antishrink efficiencies up to 95 per cent are reported and other properties of treated wood are discussed.

35. Deuterium Exchange in Alkyl Nitriles. By L. C. Leitch. Presented by Dr. Léo Marion, F.R.S.C.

The base-catalysed exchange reaction between nitriles and deuterium oxide has been successfully used to prepare a number of deuterated nitriles, viz. CD_3CN, CH_3CD_2CN, $CNCD_2CD_2CN$, etc. On hydrolysis with N nitric or hydrochloric acids the corresponding acids were obtained in excellent yields without undergoing loss of deuterium. The acids were usually isolated as silver salts. Alkyl bromides RCD_2Br were prepared by brominative decarboxylation of these salts.

36. Kinetics of the Enzymatic Hydrolysis of a Strong Anticholinesterase. By F. C. G. Hoskin and G. S. Trick. Presented by G. O. Langstroth, F.R.S.C.

The kinetics of the enzymatic hydrolysis of Tabun (ethyl N,N-dimethylphosphoramidocyanidate) have been investigated. The reactions have been followed manometrically, polarimetrically and toximetrically at pH 7–7.5 in the presence of rat serum and bicarbonate buffer. The non-enzymatic hydrolysis appears to be a single first-order reaction. The enzymatic hydrolysis, however, can be resolved into two simultaneous first-order reactions having markedly different rate constants. All of the results indicate that Tabun is a racemic compound having the phosphorus atom as the centre of asymmetry, composed of a slowly hydrolysed non-toxic levorotatory isomer and a rapidly hydrolysed toxic dextrorotatory isomer.

37. On the Origin of the Anomalous Sonic Absorption in Certain Binary Liquid Systems. By W. G. Schneider, F.R.S.C.

Certain binary liquid systems, such as water-alcohol solutions, exhibit an excess ultrasonic absorption which has a maximum value at some intermediate concentration. The maximum absorption is many-fold greater than that of either of the pure components. This excess absorption, which is undoubtedly due to some structural relaxation process, has hitherto not been explained. An approximate molecular theory is presented which is based on a two-state model and involves nearest neighbor "unmixing" in the sound field. If the volume change on mixing the two components is negative, compression will cause an excess population of AB pairs at the expense of AA and BB pairs. The pair populations can be expressed by making use of the quasi-crystalline liquid model. The "unmixing," which results from a perturbation of the pair populations from their equilibrium values, has associated with it a relaxation time. An expression for the relaxation time, which is composition-dependent, is derived. Finally the relaxational compressibility is related to the volume change on mixing, ΔV, the interchange energy, ω, and the composition. Satisfactory agreement between the measured and calculated absorption as a function of composition for water-alcohol solutions was obtained. The theory yields relaxation times of the order of 10^{-9} sec.

38. The Effect of Deuterium Substitution on the Intensity of the Raman Bands of Acetonitrile and Methyl Chloroform. By J. C. Evans and H. J. Bernstein, F.R.S.C.

Raman spectra with depolarization measurements and intensities have been obtained

photoelectrically for light and heavy acetonitrile and methyl chloroform, and the intensity sum rules for isotopic substitution have been verified within the experimental error. A sum rule for depolarization ratios is derived which provides some information with regard to the change in depolarization ratio of corresponding bands on isotopic substitution. The spectrum of CD_3CCl_3 permits a definitive assignment to be made for methyl chloroform (resolving the existing disagreement).

39. On the Gas Phase Decomposition of Hydrogen and Deuterium Peroxides. By Paul A. Giguère, F.R.S.C., and I. D. Liu.

The kinetics of the thermal decomposition of concentrated hydrogen and deuterium peroxides in the gas phase were investigated by a static method at pressures of 10–15 mm. Hg over the range 350–520°C. After appropriate passivation treatments it was possible to get nicely reproducible rates in various reactions vessels, thereby confirming that the decomposition was predominantly homogeneous. The activation energy thus obtained, 43 kcal/mole, is some 10 kcal. smaller than the dissociation energy after the reaction

$$H_2O_2(g) = 2OH\ (g).$$

For the isotopic peroxide the rate constants and activation energy are very slightly greater than for H_2O_2.

At low temperature surface effects become noticeable.

40. Studies on Alumina Catalysts. By L. A. Munro, F.R.S.C., and R. A. Washington.

The reaction of ethylaniline and ethanol over alumina catalysts was studied at 300°C. The gel water of the alumina affects its catalytic activity, maxima and minima in activity corresponding to those found previously in the dehydration of ethanol and formic acid. There is no concurrent change in crystal structure of the alumina gel. The results suggest the initial dehydration of alcohol to ether followed by condensation of ether and ethyl aniline to give diethyl aniline.

9.00 a.m.—Sub-section METEOROLOGY—Room 106, McLennan Laboratory. PAPERS 41–51.

41. Observation of Snow by Radar. By J. S. Marshall, F.R.S.C.

A radar with fixed vertically-pointing beam records the snow pattern passing overhead with improved resolution. Comparison of these records with upper air analyses provides further evidence that at least the major part of Montreal snowfall is formed in compact generating elements located at frontal surfaces, the almost horizontal boundaries between air masses of different characteristics. A new higher-power radar scanning in three dimensions reveals the pattern of generating elements in plan at the generating level.

42. Dynamical Considerations of Snow-generating Elements. By R. H. Douglas. Presented by A. Thomson, F.R.S.C.

In the atmosphere, appreciable vapour supersaturation may exist with respect to the ice-phase; the removal of this vapour excess by the sublimational growth of ice crystals supplies thermal energy, as a result of which significant vertical velocities may develop in an atmosphere which is hydrostatically stable. The heat-release, and consequent vertical

motion, is much greater in the absence of supercooled cloud than in its presence. Consideration of these factors leads to a tentative picture of the dynamics of snow-generating elements.

43. Improvements in the Canadian Radiosonde. By H. H. Bindon and W. Smith. Presented by Andrew Thomson, F.R.S.C.

The Canadian radiosonde is an instrument carried up by a balloon which measures temperature, pressure, and humidity in the high atmosphere and telemeters the values to the ground by radio. It consists of a motor meteorograph in which a flat spiral contacting switch is rotated by an electric motor at a uniform rate. Air temperature determinations have been made more accurate by improving the ventilation of the temperature element. Using the radio theodolite and a 403 mc transmitter in conjunction with the radiosonde, the direction and velocity of the upper winds can now be determined.

44. Synoptic Evidence for a Direct Circulation about a Jet Stream. By R. Lee. Presented by Andrew Thomson, F.R.S.C.

Theory predicts the existence of vertical direct thermal circulations at the entrance regions of jet-stream maxima and indirect thermal circulations at the exit regions. Recent investigations have produced indirect observational evidence for the existence of both horizontal and vertical branches. The study of a tropopause perturbation over the southern United States in November 1953 following the eastward passage of a jet-stream maximum can be interpreted in terms of a direct thermal circulation, and is thus presented as direct observational evidence in support of the theory.

45. The Structure of the Atmosphere at High Levels. By D. P. McIntyre. Presented by Andrew Thomson, F.R.S.C.

The structure of the atmosphere over North America for winter and summer has been studied by means of special cross-sections to heights of about 70,000 ft. These cross-sections and associated charts are based on wind data and reveal the basic wind and temperature structure of the troposphere and lower stratosphere. It is found that temperature gradients in the stratosphere are comparable to, and perhaps stronger than, those in the troposphere.

46. A Preliminary Estimate of the Average Insolation in Canada. By C. L. Mateer. Presented by Andrew Thomson, F.R.S.C.

A series of twelve charts, showing the average insolation received in Canada during each month of the year, is presented. In the preparation of these charts, instrumental observation of insolation have been supplemented by utilization of empirical equations relating average insolation to average sunshine and/or cloudiness. The important features of the charts are discussed briefly.

47. The Evaluation of Commercial Cloud-seeding Operations in Canada. By Warren L. Godson. Presented by Andrew Thomson, F.R.S.C.

During the summer months of 1953 and 1954, commercial cloud-seeding operations were undertaken in the extreme southwestern sector of Manitoba and in the Saskatchewan Forks region (1954 only), using ground silver-iodide generators. A statistical evaluation of these operations has been undertaken. The extreme difficulties encountered in attempting to

obtain results of significance will be outlined, and illustrated by a brief discussion of the Prairie data.

48. An Automatic Dewpoint Recorder. By H. H. Bindon, A. W. Hooper, and J. S. Dickson. Presented by Andrew Thomson, F.R.S.C.

An automatic dewpoint recorder has been developed which measures the dewpoint to an accuracy of ± 0.1 degrees Celsius down to $-50°C$. The air to be measured is blown in a jet over a polished flat metal button which is cooled to the dewpoint by means of a small commercial refrigeration unit using Freon 12. The unique feature of the instrument is the control of the temperature of the dew surface by means of a jet of hot freon gas drawn from the high pressure side of the refrigeration system which impinges on the underside of the dew button. When the dew commences to form, it is detected by a germanium photocell, the output of which is amplified to activate a magnetic valve in the hot jet line. The hot gas removes the dew immediately and the button temperature hunts about the dew point. The temperature of the button is measured by means of a recording thermocouple.

49. Condensation Trails and Cloud Physics. By J. Clodman. Presented by Andrew Thomson, F.R.S.C.

Godson and Appleman, by considering the heat and moisture output of jet aircraft, have developed curves for forecasting regions of condensation trail formation. Analysis of a large number of contrail occurrences reveals that, in general, they would be forecast by the curves. However there are a significant number of cases where the curves would forecast contrails and yet none occurred. This suggests that there is an additional factor in contrail formation, probably involving condensation or sublimation nuclei. The implications of this for cloud physics are discussed.

50. The Aerology of Hurricane Hazel. By J. L. Knox. Presented by Andrew Thomson, F.R.S.C.

The remarkable transformation of this tropical storm into a vigorous frontal storm as it entered the Temperate latitudes will be discussed. The atmospheric flow patterns and temperature gradients at levels of approximately 10, 20, and 30 thousand feet, prior to and during the movement of the storm into Ontario illustrate how the storm found a new source of energy as it moved inland from the Atlantic seaboard.

The role of the main polar front will be discussed. Prior to the onset of "Hazel," this front became orientated in a north-south position over Ontario with its surface position almost stationary over the Toronto area. The exact position of this front was a critical factor in determining where the tremendous supply of moisture borne by "Hazel" would be released.

51. Weather Features in Ontario of the Storm "Hazel." By M. K. Thomas. Presented by Andrew Thomson, F.R.S.C.

Rain and wind from the storm "Hazel" began to affect southern Ontario early on the afternoon of Friday, October 15, 1954. The storm centre passed over Toronto at 11 P.M., was over Parry Sound at 1 A.M. on October 16th, and passed east of Timmins at 7 A.M. Many rainfall records were broken; the heaviest rainfall was recorded along and immediately to the west of the storm track. Wind speeds were high but did not exceed previous extremes.

2.00 p.m.—Sub-section MATHEMATICS—Room 101, McLennan Laboratory. PAPERS 52–61.

52. Initial Segments of Positive Semigroups. By Joachim Lambek. Presented by W. L. G. Williams, F.R.S.C.

While discussing the nature of angles, H. Zassenhaus recently characterized the additive systems of all reals and all integers not exceeding some bound. A new set of three necessary and sufficient conditions is here presented under which a set M with a partial binary operation $+$ is isomorphic with an initial segment of the positive reals or integers:

(1) $(x + y) + z = x + (y + z)$ if either is defined;

(2) $x \neq y$ if and only if $x \in M + y$ or $y \in x + M$;

(3) if $X \subset M$ then $X + M$ is either empty or M or $x + M$ for some $x \in M$.

(1) suffices to embed M in a semigroup S; (2) is used to extend S to a simply ordered group G with positive part S; (3) shows that G is complete.

53. On 1-Parametric Groups. By Hans Zassenhaus. Presented by W. L. G. Williams, F.R.S.C.

A 1-dimensional group germ is defined as a topological space together with a point p_0 of S and a 1-dimensional compact connected neighbourhood S' of p_0 in S; furthermore a continuous function on the points $p \times q$ of $S' \times S'$ with value pq in S so that (1) $S'S$ is contained in S, (2) $pp_0 = p_0p = p$, (3) the associative law of multiplication whenever both sides are defined, (4) $pq = pr$ implies $q = r$. It is shown that there is a homeomorphism h of S' onto a closed interval $[a, b]$ of the real axis for which $a \leqslant 0 \leqslant b$, $a < b$, and $h(p) + h(q) = h(pq)$. The proof makes use of a set of axioms for closed intervals of the real axis given by J. Lambek at this meeting.

54. On Algebraic Groups of Matrices. By Hans Zassenhaus. Presented by W. L. G. Williams, F.R.S.C.

Associating with each non-vanishing matrix $A = (a_{ik})$ of degree n over an extension E of a field of reference F the point (A) of the projective space $M_n(E)$ of $n^2 - 1$ dimensions over E with its homogeneous coordinates being the n^2 coefficients of the matrix A, an algebraic group over F of degree n is defined as an algebraic manifold G of the $M_n(F)$ over F such that (1) the point associated with the identity matrix I_n belongs to G, (2) together with (A), (B) also (AB) belongs to G. This definition is closely related to the one given by C. Chevalley, replacing nonhomogeneous coordinates by homogeneous coordinates. Let $G_1, G_2, \ldots, G_r$ be the irreducible components of G containing points which are associated with regular matrices. They have all the same dimension d. There is precisely one, say G_1, which contains (I_n) and this is again an algebraic group. For any extension E of F the regular matrices associated with points of G_i and with coefficients in E form a set $G_i(E)$ which is either empty or a normal coset modulo $G_1(E)$, a multiplicative group of matrices. All non-empty sets together form a group $G(E)$ containing $G_1(E)$ as a normal subgroup of finite index. If the field F is perfect then a restricted linear Lie algebra $L(G)$ of dimension d over F is derived from G (or just as well from G_1) as the tangent space in (I_n). Only at characteristic 0 the group G_1 always is uniquely determined by G. For any Cartan subalgebra H of $L(G)$ the normalizer of H in G is an algebraic group J such that $H = L(J)$.

55. The Differentiability Properties of an Interior Point of an Arc of Cyclic Order 3. By N. D. Lane. Presented by H. G. Thode, F.R.S.C.

It is known that an end-point of an arc of cyclic order 3 is strongly differentiable, and that an interior point u of such an arc is not necessarily conformally differentiable. The interior point u, considered as an end-point of each of two subarcs of cyclic order 3, has, therefore, two one-sided tangent circles through each point $R \neq u$, and two one-sided osculating circles.

The following results are proved in this note: (1) The two one-sided tangent circles of u through a fixed point $R \neq u$ coincide. This implies that u satisfies Condition I for conformal differentiability (cf. N. D. Lane and Peter Scherk, Differentiable points in the conformal plane, Can. J. Math. *5*, 1953: 512–518). (2) The set of general tangent circles of u coincides with the pencil of ordinary tangent circles of u. The set of general osculating circles of u forms a closed interval in the pencil of all the tangent circles of u, bounded by the two non-degenerate one-sided osculating circles of u.

56. Differentiable Points of Arcs in Conformal 3-Space. By N. D. Lane and F. A. Sherk. Presented by H. G. Thode, F.R.C.S.

This paper is a generalization of a paper by N. D. Lane and Peter Scherk on differentiable points in the conformal plane, Can. J. Math. *5*, 1953: 512–518. Conform-differentiability at a point p of an arc A is defined by certain families σ_0, σ_1, σ_2, and σ_3 of tangent spheres through p; σ_3 is the osculating sphere of A at p. With the families σ are associated families γ_0, γ_1, σ_2 of tangent circles through p, where γ_2 is the osculating circle of A at p. The intersection and support properties of the families $\sigma_i - \sigma_{i+1}$, $i = 0, 1, 2$, and the natures of the osculating circle and the osculating sphere, lead to a classification of the differentiable points into 32 types. Each type is described by means of a characteristic $(a_0, a_1, a_2, a_3; i)$.

57. Abstract Definitions for the Plane Crystallographic Groups. By H. S. M. Coxeter, F.R.S.C.

The 17 two-dimensional space-groups (i.e., the 17 ways of repeating a flat design, as on wallpaper) were discovered empirically by the Moors in their decoration of the Alhambra. The first mathematical treatment was by Fricke and Klein (1897). The groups were rediscovered by Pólya and Niggli (1924) and were shown by Nowacki (Schweiz. Min. Petr. Mitt. *34*, 1954: 160–168) to be abstractly distinct. The present paper gives an abstract definition for each group in terms of two, three, or four generators. The two cases in which a single relation suffices have a connection with topology: $XY = YX$, generated by two translations, and $P^2 = Q^2$, generated by two parallel glide-reflections, are the Poincaré groups of the torus and the Klein bottle, respectively.

58. An Abstract Definition for the Mathieu Group $\mathfrak{M}_{11}$. By W. O. J. Moser. Presented by H. S. M. Coxeter, F.R.S.C.

K. D. Fryer has shown (Can. J. Math. *7*, 1955: 24) that the Mathieu group $\mathfrak{M}_{11}$ of degree 11 and order 7920 is generated by the permutations $S = (0\,1\,2\,\ldots\,10)$, $B = (1\,4\,5\,9)$ $(2\,8\,10\,7\,6)$ and $C = (2\,10\,8\,6)(3\,9\,4\,5)$. Hence it is also generated by the permutations $A = S^4 = (0\,4\,8\,1\,5\,9\,2\,6\,10\,3\,7)$, B and C, which are seen to satisfy the relations

$$A^{11} = B^5 = C^4 = (AC^2)^3 = (B\,C^2)^2 = (A^3\,B\,C)^3 = E,$$
$$B^{-1}AB = A^4,\ C^{-1}BC = B^3.$$

By using the Todd-Coxeter enumeration method (Proc. Edinburgh Math. Soc. (2) *5*, 1936: 26–34) it is shown that the abstract group defined by the above relations is isomorphic to $\mathfrak{M}_{11}$.

59. On the Number of Ordinary Lines determined by n Points in the Plane. By W. O. J. Moser. Presented by H. S. M. Coxeter, F.R.S.C.

Let n points, not all collinear, in the real projective plane, be connected in all possible ways by straight lines. A connecting line which contains exactly 2 of the given points is called an ordinary line. Let t_n be the minimum number of ordinary lines determined by any set of n non-collinear points. A famous conjecture of Sylvester (1893) may be expressed in the form $t_n \geqslant 1$ $(n \geqslant 3)$. This was proved by Gallai (1933) and Steinberg (1944). Motzkin (Trans. American Math. Soc. *70*, 1951: 451) showed that $t_n \geqslant (2 - \epsilon)^{\frac{1}{2}} n^{\frac{1}{2}}$ for arbitrary ϵ and sufficiently large n. Motzkin's proof is refined to yield $t_n \geqslant (2\frac{1}{2} - \epsilon)^{\frac{1}{2}} n^{\frac{1}{2}}$.

60. A Generalization of the Polyhedral Groups. By W. O. J. Moser. Presented by H. S. M. Coxeter, F.R.S.C.

The abstract polyhedral groups (l, m, n) are defined by the relations

$$R^l = S^m = (RS)^n = E \text{ or } R^l = S^m = T^n = RST = E.$$

Miller (Miller, Blichfeldt and Dickson, Finite Groups; New York, 1916: 152–158) investigated the generalization $R^l = S^m$, $(RS)^n = E$, and Coxeter (Duke Math. J. *7*, 1940: 367) the different generalization $R^l = S^m = T^n = RST$. Similar methods are used to investigate the groups $R^l = S^m = E$, $(RS)^n = (SR)^n$, which are finite when

$$\frac{1}{l} + \frac{1}{m} + \frac{1}{n} > 1.$$

In fact, the order is

$$\frac{4}{n}\left(\frac{1}{l} + \frac{1}{m} + \frac{1}{n}\right)^{-2}.$$

61. Radical Rings with Nilpotent Associated Groups. By S. A. Jennings. Presented by R. D. James, F.R.S.C.

Let R be an associative ring which is a radical ring in the sense of Jacobson. Then the elements of R form a group G under the multiplication $x \circ y = x + y + xy$. The group G is said to be associated with R, while the Lie ring $\Lambda = (R)^l$ formed by the elements of R under addition and the multiplication $x \circ y = xy - yx$ is the Lie ring associated with R. Relations between R, G and Λ are studied. In particular, it is proved that if G is nilpotent then Λ is nilpotent, and conversely.

2.00 p.m.—Sub-section METAL PHYSICS—Room 106, McLennan Laboratory. PAPERS 62–71.

62. The Magnetic Susceptibility of Primary Solid Solutions of B Sub-Group Metals in Copper, Silver, and Gold. By W. G. Henry and J. L. Rogers. Presented by I. E. Puddington, F.R.S.C.

The variation at room temperature with concentration of the magnetic susceptibility of a number of systems is presented. The variation of the density of states in copper, silver, and gold, the state of localized electrons and the relative properties of the solutes are discussed on the basis of the magnetic measurements.

63. Diamagnetic Susceptibility of Germanium-Antimony Alloys. By F. T. Hedgcock. Presented by G. Herzberg, F.R.S.C.

In order to explain the published results of Owen on the temperature dependence of the susceptibility of germanium, it is necessary to assume impurity concentrations as great as 1 per cent. Measurements made by the author indicate that an impurity concentration as high as this is extremely unlikely.

The diamagnetic susceptibility of zone-refined germanium and a series of *n*-type germanium-antimony alloys with impurity concentrations up to 5×10^{18} impurities per cubic centimetre have been measured between the temperatures 20°C. and −196°C. The experimental results cannot be explained by assuming a simple 1/T law is obeyed for the susceptibility of the impurity electrons and it seems necessary to postulate that the effective mass of the conduction electrons is a function of temperature.

64. Measurements on the Alkali Metals below 1°K. By J. S. Dugdale and D. K. C. MacDonald. Presented by G. Herzberg, F.R.S.C.

Measurements have been made of the electrical resistance of alkali metals from ∽4°K to ∽0.1°K and will be reported. Possible methods of calorimetry below 1°K are being explored and the characteristics of carbon resistors as thermometers in this region are being investigated.

65. The Significance of Size-Effect Measurements. By R. G. Chambers. Presented by G. Herzberg, F.R.S.C.

Information may be obtained about the mean free path of conduction electrons in metals from measurements of the D.C. conductivity of thin films and wires, of thickness comparable with the mean free path, *l*, and similarly from measurements of the R.F. conductivity of metal surfaces when the skin depth is comparable with *l*. Pippard (Proc. Roy. Soc. A*224*, 1954: 273) has shown how R.F. measurements on single crystals can be interpreted in terms of the shape of the Fermi surface. The possibility is now examined of obtaining similar information from D.C. measurements on thin films, and of obtaining further information from measurements in a magnetic field.

66. Thermoelectric Power and Thermal Conductivity of Germanium at Low Temperatures. By E. Mooser and S. B. Woods. Presented by G. Herzberg, F.R.S.C.

Considerable theoretical work has been done recently on the problem of phonon-electron interactions in semiconductors and in connection with this, some experimental measurements of the thermoelectric power of germanium have appeared in the literature. An observed increase in the thermoelectric power below about 100°K is attributed to phonon-electron interaction.

Measurements made between 2°K and 150°K on various high purity *n*- and *p*-type germanium samples prepared in the laboratory, will be discussed. Thermal conductivity measurements made at the same time in these samples will also be presented. Owing to the small number of electrons present in a semiconductor, it would be expected that the thermal conductivity would be of the general form of that for a dielectric solid. Although this is true in general, differences between the observed and theoretical curves near the maximum in the conductivity seem significant.

As an aid in interpreting these data, measurements of the electrical resistivity and the Hall voltage have been made on these same samples from room temperature to 20°K.

67. Anomalous Electron Scattering in Dilute Solid Solutions of Iron and Copper. By W. B. Pearson. Presented by G. Herzberg, F.R.S.C.

Systematic measurements of electrical resistivity and thermoelectric force of dilute

alloys of iron in solid solution in copper, made continuously between 4.2°K and ∽50°K, show (i) that iron has a rather large scattering cross-section in copper; (ii) that iron exhibits a remarkably large anomalous scattering of the conduction electrons.

The anomalous resistive component has been calculated and it is found that it does not follow an exponential or power law dependence on temperature, but down to ∽3°K follows an empirical law of the form

$$r_{\text{anomalous}} = f(rc)(\theta - T)^n,$$

where θ is a characteristic temperature, (rc) is the normal impurity scattering for the added iron and n has a value of ∽2. Taken at its face value, this would suggest that the resistance minimum, in this case at least, is the result of some transition phenomenon.

68. The Effect of Thin Films of Gold on the Mechanical Properties of Cadmium Single Crystals. By Frederick Lipsett and R. King. Presented by D. W. R. McKinley, F.R.S.C.

Thin films of oxides, hydroxides or metals have been shown to increase the stress at which plastic deformation starts by an amount which cannot be explained by the strength of the films themselves. Most experiments have been on creep, showing the effects of oxides and hydroxides. In the present work (done at the Davy Faraday Research Laboratory, London, England) thin films of the metal gold were found to increase the stress at which plastic deformation started by about 6 gm. wt. mm.$^{-2}$ The increase was independent of film thickness for films of 1,500 Å to 24,000 Å. The nature of the effect of the film upon the stress-strain curves depended upon the orientation of the crystals.

69. Segregation of Solute to Grain Boundaries and Metal Surfaces. By W. C. Winegard. Presented by L. M. Pidgeon, F.R.S.C.

The segregation of polonium to grain boundaries and surfaces of lead crystals has been investigated. It has been shown that segregation occurs to grain boundaries consisting of edge-type dislocations, while no segregation is evident when the boundary is composed of screw-type dislocations.

The concentration of polonium at the free surface has been shown to increase markedly during room temperature annealing. This phenomenon occurs even when the original concentration is approximately 10^{-7} polonium in lead. The segregated layer is approximately 10,000 atoms thick.

70. Dislocations and Crystal Growth from the Melt. By C. Elbaum. Presented by L. M. Pidgeon, F.R.S.C.

In 1949, Frank proposed that crystal lattice imperfections known as screw dislocations play a major role in the mechanism of crystal growth from vapours and solutions.

Evidence has now been found in this laboratory which suggests that dislocations may play a similar role in growth from the melt. The structure of the solid-liquid interface is preserved by decanting the liquid ahead of the interface.

71. The Effect of Impurities on the Solidification of Metals. By J. W. Rutter. Presented by L. M. Pidgeon, F.R.S.C.

It is shown that, under certain conditions of solidification of a melt of impure metal, a smooth solid-liquid interface breaks down into an array of projections giving the appearance of hexagonal cells. This corresponds to a redistribution of impurity in the neighbourhood of the interface. The transition from a smooth to a cellular interface depends upon the

ratio of the temperature gradient, G, in the liquid to the rate of solidification, R, and upon the concentration of the particular impurity in the melt. It is shown that a measurement of G/R corresponding to the transition allows determination of extremely low impurity concentrations in the melt.

2.00 p.m.—Sub-section SPECTROSCOPY—Room 132, McLennan Laboratory. PAPERS 72–84.

72. The Energies of the Ground States of He, Li^+ and O^{6+}. By S. Chandrasekhar, F.R.S., and G. Herzberg, F.R.S.C.

A complete 14-parameter calculation for the ground state of He and similar 10-parameter calculations for the ground states of Li^+ and O^{6+} have been carried out. In addition, using the four most important of eleven terms, which were tried individually as fifteenth parameters, an 18-parameter calculation for He has been carried out but without minimizing against the scale parameter k. Similar 12-parameter calculations were carried out for Li^+ and O^{6+} using the two most important terms beyond the tenth in the He calculation. As a result, the 18-parameter non-relativistic ionization potential of He is found to be 198311.4 cm^{-1}. The series of 6, 10, 14, 18 parameter values appears to converge to $198312._3$ cm^{-1} with an error of less than 2 cm^{-1}. Adding the relativistic corrections yields $198310._4$ cm^{-1} which agrees to 0.1 cm^{-1} with the latest experimental value. Considering the uncertainties of the theoretical and experimental values, the magnitude of the Lamb shift of the ground state of He (compared to He^+) must be less than 3 cm^{-1} which does not contradict present theoretical estimates.

73. Infrared Absorption in Gaseous, Liquid, and Solid Carbon Dioxide induced by Intermolecular Forces. By V. Gaizauskas and H. L. Welsh, F.R.S.C.

The ν_1 infrared absorption band of carbon dioxide, induced by intermolecular forces, has been previously studied in the compressed gas; the investigation has now been extended to the liquid and the solid. The band observed in thick crystals is totally different from that observed in the liquid, and is interpreted as sum and difference tones of the molecular vibrational frequencies with the lattice frequencies. The change in the absorption in the transition from liquid to solid can be understood in terms of the crystal structure and the hindering of the molecular rotation in the solid.

74. The Infrared Absorption of Liquid and Solid Hydrogen and its Dependence on the Ortho-para Ratio. By W. F. J. Hare and Elizabeth J. Allin. Presented by H. L. Welsh, F.R.S.C.

The fundamental infrared absorption of liquid and solid hydrogen has been studied from 22°K to 4.2°K with ortho-para ratios varying from 0 to 0.75. The absorption consists of two patterns: one of broad lines interpreted as absorption induced by overlap forces, and one of sharp lines due to quadrupole interactions. There is evidence for the persistence of local order in the liquid several degrees above the melting point. The relation of the absorption to that observed in the high pressure gas and the dependence of the intensities of the various components on the ortho-para ratio will be discussed. Preliminary observations on the absorption in the overtone region have been made.

75. A Method for the Rapid Determination of Wavelengths. By K. M. Baird. Presented by L. E. Howlett, F.R.S.C.

A technique for rapid determination of the order of interference in a Fabry-Perot etalon by observing the atmospheric pressure change required to make the order integral has been described (K. M. Baird, J. Opt. Soc. Am. *44*, 1954: 11). The application was to visual and photoelectric measurements. The principle has now been adapted for use with photography. This results in two new advantages: first, the method can be used with very faint lines; secondly, the wavelengths of large numbers of lines can be measured very quickly (as required in preparing wavelength tables, for example). Photographs are shown illustrating the application to the iron spectrum.

76. A Hollow Cathode Hg 198 Lamp. By K. M. Baird and K. H. Hart. Presented by L. E. Howlett, F.R.S.C.

A hollow cathode lamp has been designed and made by means of which it is practical to excite Hg 198 at the temperature of liquid air. Some of the characteristics of the radiation such as line sharpness and suitability for wavelength standards are described.

77. Magnetic Interactions in Interconfiguration Perturbation: Application to Pb III. By J. F. Hart and M. F. Crawford, F.R.S.C.

The 6sng of Pb III have anomalous fine structures. They can only be explained by considering the interconfiguration perturbation between them and the $5d^{9}6s^{2}6d$. The perturbation was formulated including all interactions both electrostatic and magnetic, but an approximate calculation of the interconfiguration parameters indicated that only two were important: the electrostatic and spin-other-orbit. Specific values of these parameters give a consistent explanation of the anomalous fine structure and of the magnetic hyperfine structure which demands almost pure *jj* wave functions for the 6sng levels.

78. Infrared Absorption induced by an Electric Field. By M. F. Crawford, F.R.S.C., I. R. Dagg, and R. E. MacDonald.

The fundamental vibration-rotation absorption band of molecular hydrogen induced by a static electric field has been observed. From the experimental data the isotropic and anisotropic parts of the 1–0 matrix element of the polarizability are obtained very directly. The value of the isotropic part is in fair agreement with the latest theoretical value, but the value of the anisotropic part is much smaller than that calculated theoretically. From the half-width of the contour of the specific absorption coefficient the optical collision diameter has been determined for the first time. It is only 0.5A which is smaller than the internuclear separation of the hydrogen molecule. This value, however, is compatible with the interaction potential of two hydrogen molecules.

79. Excitation of the λ4050A Group of Cometary Bands in Oxy-Hydrocarbon Flames. By G. V. Marr and R. W. Nicholls. Presented by A. D. Misener, F.R.S.C.

The λ4050A group of C_3 bands appearing in the emission spectra of comets and in the absorption spectra of cool stars have recently been observed in several laboratory sources including oxy-hydrocarbon flames.

As part of a programme of intensity measurements on band systems of astrophysical interest, the emission spectra of the luminous region of fuel-rich oxy-acetylene flames have

been examined over the wavelength region λλ3800–4300A. The λ4050A group and an associated underlying violet continuum with maxima at λ4000A and λ4300A were observed in addition to bands of C_2, CH, and CN. Relative intensity measurements on these spectra produced under different flame conditions are reported and discussed.

This work has been made possible by the Air Force Cambridge Research Centre and Imperial Oil Limited.

80. The Quantitative Significance of Eye Estimates of Band Intensities. By R. W. Nicholls. Presented by A. D. Misener, F.R.S.C.

Emphasis in spectroscopy upon accurate wavelength measurements and energy level assignments together with the difficulty of making accurate intensity measurements of spectra over a large wavelength range has resulted in relatively few arrays of band intensities being available for interpretation in terms of source conditions and transition probabilities. However, many workers reported together with their wavelength measurements and energy level assignments, "eye estimates" of relative band intensities. A method will be described which establishes a criterion of quantitative significance for such estimates and which allows the interpretation of the significant estimates in terms of source conditions and molecular constants. This method may be useful in the interpretation of low dispersion spectra from feeble sources.

This work has been made possible by the Air Force Cambridge Research Centre.

81. Absorption Spectra of Free PH_2 and PD_2 Radicals. By D. A. Ramsay. Presented by G. Herzberg, F.R.S.C.

Free PH_2 and PD_2 radicals were produced by the flash photolysis of PH_3 and PD_3 and their absorption spectra photographed using a 21 ft. concave grating spectrograph. Eleven bands of PH_2 and thirteen bands of PD_2 were found in the region 5500–3500 Å. The bands form regular progressions with vibrational spacings varying from 980 cm^{-1} to 880 cm^{-1} for PH_2 and 690 cm^{-1} to 625 cm^{-1} for PD_2, corresponding to successive quanta of the bending frequency in the upper electronic state. The vibrational intervals decrease regularly with increasing vibrational quantum number for the first seven PH_2 bands and the first ten PD_2 bands, but then the vibrational spacings begin to increase with increasing vibrational quantum number. This effect, which begins to appear at the same value of the vibrational energy for PH_2 and PD_2, is thought to be due to repulsive interaction of the H or D atoms at very large amplitudes of bending.

82. The Spectrum of CN in the Vacuum Ultraviolet. By P. K. Carroll. Presented by G. Herzberg, F.R.S.C.

The spectrum of the CN radical has been investigated in the Schumann region using a three-metre vacuum spectrograph in the third and fourth orders. A hollow cathode discharge through streaming helium, to which a trace of cyanogen was added, was used as a source. Three new systems of bands were found in the region 1650–2000 Å. Two hitherto unknown states were identified in the transitions: a $^2\Sigma$ state designated E, which gives rise to the transitions $E^2\Sigma \rightarrow X^2\Sigma$ and $E^2\Sigma \rightarrow A^2\Pi$, and a $^2\Delta$ state designated J, which gives rise to the transition $J^2\Delta \rightarrow A^2\Pi$. Rotational analyses of the bands have been made and the molecular constants evaluated.

83. The Structure of the Spark Spectra of Arsenic. By R. E. Bedford and A. M. Crooker. Presented by G. M. Shrum, F.R.S.C.

The spectra of arsenic II, III, and IV have been excited in an electrodeless discharge and completely remeasured in the region λλ9300–527A. Considerable revision and extension of earlier analyses (Nat. Bur. Stds., Atomic Energy Levels, vol. II, 1952) have resulted from a preliminary analysis of these data (R. E. Bedford, A. M. Crooker, Phys. Rev. *96*, 1954: 845A). In As II all terms arising from the odd configurations $4s4p^3$, $4p5s$, $4p4d$, $4p6s$, $4p5d$, $4p7s$ and from the even configurations $4p^2$, $4p5p$, $4p4f$, $4p6p$ have likely been found as well as several higher terms including some 6 terms above ionization. A tentative value for the ionization potential is 151,000 cm^{-1}.

In As III the deep $4s4p^2\ ^4P$ has been identified as well as the $6g^2G$ and $7g^2G$, which fixes the ionization potential near 228,500 cm^{-1}. In As IV the identification of $4s6p^3P$ allows a re-evaluation of the ionization potential as 410,000 cm^{-1}.

The extended analyses are in agreement with published hfs. and Zeeman effect data.

84. Raman Spectroscopy of Gases. By J. Romanko, T. Feldman, L. Krause, P. M. Mathai and G. G. Shepherd. Presented by H. L. Welsh, F.R.S.C.

The equipment for photographing Raman spectra of low pressure gases with high spectral resolution has been improved. The characteristics of high current mercury lamps have been studied and new designs tested. Rotation-vibrational bands can be photographed with a reciprocal linear dispersion of 10.5 cm^{-1} per mm. and a practical resolving power of about 1 cm^{-1}. The spectra of carbon dioxide, monodeuteromethane, heavy ammonia, and acetylene have been studied recently and vibrational and rotational constants evaluated. Some details of a new Raman source and a grating spectrograph of high light power, now under construction, will be given.

2.00 p.m.—Sub-section GENERAL PHYSICS—Room 135, McLennan Laboratory. PAPERS 85–95.

85. Monte Carlo Calculations for the Diffusion of Photons in Water. By W. R. Bruce and H. E. Johns, F.R.S.C.

The distribution of photons in a scattering medium can be determined by calculating typical "case histories" by Monte Carlo method. A programme has been written for the Toronto Electronic Computor to produce these "histories" for photons of initial energies from 50 kev. to 1.25 Mev. and to put the results on I.B.M. cards.

These results are used by a second programme to determine the photon flux and energy distribution at points of interest in the scattering medium. The results will be applied in particular to physical problems arising in radiotherapy.

86. Total Emission Admittance of Thermionic Diodes. By P. A. Redhead. Presented by D. W. R. McKinley, F.R.S.C.

The admittance of a diode operating in the retarding field region of its characteristics has been calculated by Freeman who showed that the total emission (T.E.) conductance should be proportional to the saturated emission. The measured T.E. conductance is found to be proportional to saturated emission in the microwave region, but this proportionality is not observed at lower frequencies. A new theory is presented which takes into account the interaction of the radio frequency field with the electron plasma and explains the invariance of the T.E. conductance with saturated emission at low frequencies.

87. Diffraction of 3.2 cm. Electromagnetic Waves by Dielectric Cylinders and Semi-cylinders. By A. B. McLay, F.R.S.C., and M. K. Subbarao.

Diffraction patterns in the close vicinity of long dielectric cylinders of 1 inch diameter, of a lucite cylinder of 1½ inches diameter and of the same rod machined to a plano-semi-cylinder, have been observed in incident radiation polarized parallel to the cylinder axis. Patterns for the 1 inch rods are in fair agreement with those calculated by Froese and Wait, Can. J. Phys. *32*, 1954: 775. Marked trends in the patterns of the 1½ inch rods are correlated in part with geometrical optics focusing; one case is included in which double internal reflection has noticeable effect.

88. Interferometric Control in the Calibration of Air Survey Cameras. By P. D. Carman. Presented by W. E. Knowles Middleton, F.R.S.C.

For two of the flatness determinations involved in the calibration of cameras for air survey photography, special interferometric techniques have been devised.

The photographic plates from which focal length and distortion data are obtained must be flat to one or two microns. To achieve this, the ¼ inch plate glass supporting the emulsion is bent flat and held flat during exposure. Flatness is determined in an interferometer using infrared light.

Camera register glass flatness is also checked interferometrically. Since counts up to 100 fringes are required, two monochromatic light sources are used, chosen so as to produce "beats" of black and coloured fringes and permit counting by groups.

89. Brightness and Contrast in Ground Photography. By P. D. Carman and H. Brown. Presented by W. E. Knowles Middleton, F.R.S.C.

An analysis of "photographic brightness" and of differences in the logarithm of this quantity for small detail has been made for a number of typical exterior scenes. Independent measurements were made on all scenes by a photographic technique and by the use of a recording photoelectric telephotometer. The two sets of results are in close agreement. Previous values of "photographic brightness" range are confirmed by these results but a 0.17 average difference of log brightness is somewhat lower than expected.

90. The Electrical Breakdown of Liquid Dielectrics. By P. K. Watson. Presented by D. W. R. McKinley, F.R.S.C.

The mechanism of electrical breakdown in liquids has been studied experimentally and has been found to be critically dependent upon the duration of the applied voltage. In a series of tests on insulating oil (carried out at Birmingham University, England), very high strengths were obtained when voltages of microseconds duration were used, and breakdown seemed to be due to an ion multiplication process within the liquid. In the millisecond range, lower strengths were found; breakdown seemed to be initiated by bubbles formed by dissolved gases coming out of solution. For voltages approaching a duration of one second, particle impurities played a major role in the breakdown process.

91. Electrical Breakdown in High Vacuum. By A. S. Denholm. Presented by D. W. R. McKinley, F.R.S.C.

A considerable volume of work has been carried out in connection with high vacuum breakdown and several mechanisms to explain the phenomenon have been proposed. A brief survey of this work and a correlation of the theories are given. Some experiments are

described which were carried out during the years 1950–4 at the Royal Technical College, Glasgow, Scotland, on alternating, direct, and impulse voltage breakdown under engineering conditions of vacuum. Curves suitable for the design of high vacuum equipment at voltages up to 50 kev., or higher by extrapolation, are presented.

92. Ten-Centimetre Brightness Distribution of the Sun, June 30, 1954. By A. E. Covington, W. J. Medd, G. A. Harvey, and N. W. Broten. Presented by D. W. R. McKinley, F.R.S.C.

A partial eclipse of the sun was observed on June 30, 1954, at the Radio Observatory of the National Research Council in Ottawa. During the eclipse, a record of the varying ten-centimetre solar radiation from a 2° region containing the sun and moon was obtained with a paraboloidal reflector ten feet in diameter. After the eclipse, when the sun drifted through the receiving pattern of a 150-foot waveguide array, solar radio emission was observed in North-South strips approximately 1/8° wide. These observations have been interpreted in terms of a disc with a radius 1.14 times that of the photosphere, and with the equatorial regions brighter than the polar regions.

93. Radiance and Polarization of the Clear Sky near the Horizon. By B. A. Stevens. Presented by W. E. Knowles Middleton, F.R.S.C.

Using Chandrasekhar's exact solution, computations have been made of the radiance and polarization of the sky at zenith angles near 90° in a model atmosphere of pure gas with plane parallel symmetry.

The values obtained are compared with those obtained by measurements made at eight wavelengths in the actual atmosphere in clear weather. The graph of Stokes parameter U against zenith angle has the same features in the two cases, with the maximum occurring at the same zenith angle. If the measured value of U is normalized to give agreement at a zenith angle of 70° with the value of U for the model, then at greater zenith angles there is a systematic difference between the two, which depends on the wavelength.

94. Automatic Plotting of the Position of a Moving Radioactively Tagged Object. By B. C. Green and J. W. T. Spinks, F.R.S.C.

A machine has been developed which is able to record automatically the movement, in three spatial dimensions and in time, of a radioactively tagged object. The present machine was designed specifically for recording the movements of a radioactively tagged soil burrowing wireworm.

95. An Analysis of the Radiation Force acting on a Spherical Obstacle when in a Cylindrical Sound Field. By T. F. W. Embleton. Presented by L. E. Howlett, F.R.S.C.

The corresponding problems of the radiation forces acting on a spherical obstacle in a plane or spherical progressive sound field have been examined previously by L. V. King (Proc. Roy. Soc. (London) A*147*, 1934: 212) and T. F. W. Embleton (J. Acoust. Soc. Amer. *26*, 1954: 40) respectively. In these cases the sound field and scattering obstacle both have symmetry of revolution about the line joining the centre of the obstacle to the origin of the sound field, but for a cylindrical sound field there exists only a much lower degree of symmetry. A general expression has been obtained for the radiation force in terms of the complex amplitudes of spherical harmonics required to synthesize the incident sound field—for the cases of greatest symmetry this reduces to the simpler expression previously obtained. The

first twenty non-zero amplitudes have been evaluated for a cylindrical sound field and it is shown that the force is one of attraction near to the source, becomes zero at a certain distance, and at a greater distance is a force of repulsion. Qualitatively, this force is the same as for spherical waves but for any size of obstacle and frequency of the sound field the point of zero force is always nearer to the source in a cylindrical wave.

Wednesday, June 8

9.00 a.m.—Sub-section CHEMISTRY—Room 132, McLennan Laboratory, PAPERS 96–102.

96. Syntheses of Nitroguanidines of Aliphatic Acids. By Paul E. Gagnon, F.R.S.C., Paul A. Boivin, Jean L. Boivin, and Joseph Zauhar.

Guanidoaliphatic acids, $NH_2C(NH)NHCHRCOOH$, were successfully prepared by heating guanidine carbonate and α-amino acids in aqueous medium. R = H; CH_3CH_2; $C_6H_5CH_2$; CH_2COOH. The corresponding nitrates were obtained by treatment with dilute nitric acid. Upon dehydration with sulphuric acid, nitroguanidoaliphatic acids were formed. The corresponding nitrosonitroguanidoaliphatic acids were prepared by treating with sodium nitrite solutions of nitroguanidoaliphatic acids in nitric acid.

97. Reduction of 2-Chloronitrobenzene. By Paul E. Gagnon, F.R.S.C., Karl F. Keirstead, and Brian T. Newbold.

The reduction of 2-chloronitrobenzene by sodium arsenite in strong alkaline solution was systematically studied. Orthochloroaniline, 2,2′-dichloroazoxybenzene, and a purple substance melting at 156°C. were isolated. The latter was obtained in 4 per cent yield under optimum conditions. Its formula $C_{12}H_9N_2O_2Cl$ was established from molecular weight determinations and analyses. Its hydrochloride and acetyl derivative were prepared. Moreover, reduction gave $C_{12}H_{11}N_2ClO$ and oxidation yielded $C_{12}H_7N_2O_4Cl$, which formed an acetyl derivative $C_{14}H_9N_2ClO_5$. The molecular weights of all these compounds were determined. Reduction of 2,5-dichloronitrobenzene under the same conditions gave similar results.

98. Thermal Decomposition of 1-Hexanethiol. By Paul E. Gagnon, F.R.S.C., Jean L. Boivin, and Donald C. Watson.

Investigation was conducted on the thermal decomposition of 1-hexanethiol. Quantitative estimation of the pyrolysis products, both liquid and gaseous, formed the basis of the study. Desulphurization characteristics of a variety of catalysts, and effect of temperature and flow rates were also considered.

99. Syntheses and Absorption Spectra of 1-Chlorophenyl-3-phenyl-4-monosubstituted-5-pyrazolones. By Paul E. Gagnon, F.R.S.C., Jean L. Boivin, and Yvon Laflamme.

Monosubstituted benzoylacetic esters obtained by condensation of n-alkyl halides with ethyl benzoylacetate were reacted with ortho, meta, and para chlorophenylhydrazines to give 1-chlorophenyl-3-phenyl-5-pyrazolones monosubstituted in position 4 by alkyl radicals R = H, C_nH_{2n+1} (n = 1 to 9) and $C_6H_5CH_2$. Ultraviolet and infrared spectra were determined in order to establish the structures of the compounds.

100. Fusion of Mono and Disubstituted Ureas with Ammonium Sulphamate. By Paul E. Gagnon, F.R.S.C., Jean L. Boivin, and Catherine Haggart.

Substituted ureas and ammonium sulphamate, mixed in the ratios of one to one, one to two, and one to three, were heated in a metal bath, the temperature being slowly raised from 140°C. to the fusion temperature. The quantities of cyanuric acid and guanidine formed in each case were determined.

$$4RCONHCONH_2+5NH_2SO_3NH_4 = 4RCN+(HOCN)_3+H_2NC(NH)NH_2+5NH_4HSO_4 \\ +3NH_3$$

R = CH_3 or C_6H_5.

101. Transformation of Alkylguanidine Nitrates into Alkylnitroguanidines. By Paul E. Gagnon, F.R.C.S., Paul A. Boivin, Jean L. Boivin, and John H. Dickson.

The conversion of alkylguanidine nitrates into alkylnitroguanidines, $RNHC(NH)NHNO_2$, by dehydration with sulphuric acid, was systematically studied. R = C_3H_7, isopropyl; C_4H_9, isobutyl; C_5H_{11}, *n*-amyl. The reactions were carried out at temperatures ranging from 0 to 30°C. while varying the reaction time. The nitroguanidines were obtained in yields up to 92 per cent.

102. Reactions of Hydrazines with Ethyl Isothiocyanoformate and Ethyl Isothiocyanoacetates. By Paul E. Gagnon, F.R.C.S., Jean L. Boivin, Charles A. Olivier, and Roderick MacDonald.

Ethyl isothiocyanoformate was treated at low temperature by hydrazine hydrate. A white solid which decomposed above 300°C. was formed.

$$2\,SCNCOOC_2H_5+H_2NNH_2 = \begin{matrix} HN & C & N & N & C & NH \\ | & | & & | & | & \\ OC & S & & S & CO & \end{matrix} +2C_2H_5OH$$

Ethyl isothiocyanoacetates reacted similarly with hydrazine but differently with substituted hydrazines.

9.00 a.m.—Sub-section ASTROPHYSICS—Room 106, McLennan Laboratory. PAPERS 103–112.

103. The Use of FERUT in the Determination of Spectroscopic Binary Orbits. By Donald A. MacRae. Presented by Helen S. Hogg, F.R.S.C.

The calculation of the orbital elements of a spectroscopic binary is well suited to electronic computing machines. Once the observations have been assembled and weights have been assigned, the method of least squares commonly used does not require scientific judgment but it does call for numerous repetitive arithmetical operations.

The electronic computer at the University of Toronto has been coded to calculate the coefficients of the equations of condition, to form and solve the normal equations, and to calculate the final values of the six elements along with their mean errors.

104. Numbers and Types of Variable Stars in Globular Clusters. By Helen S. Hogg, F.R.S.C.

A recent catalogue, compiled by the writer, contains 1421 variable stars in 72 globular

clusters, and yields interesting data in this field. One quarter of these clusters have more than 20 variables each, but the most frequent number of variables for a globular cluster is one. About 1100 of the variables are RR Lyrae type, with periods ranging from 0.06 to 0.91 day, with a curious scarcity of periods around 0.45 day. There are 122 variables definitely not of RR Lyrae type, including novae, Cepheids, W Virginis and RV Tauri stars, eclipsing and W Ursae Majoris variables, SS Cygni and irregular and semiregular types. More observations are needed for many of these stars to determine whether they are actual cluster members.

105. The Radial Velocities of 1050 Stars of Late Spectral Type. By John F. Heard. Presented by C. A. Chant, F.R.S.C.

A programme for the determination of the radial velocities of 1050 stars which was initiated at the David Dunlap Observatory nine years ago has now been completed. This programme includes those stars of H.D. spectral type Go and later and brighter than ninth magnitude which are located in Yale zone $+25°$ to $+30°$. For these stars proper motions are available, luminosity classifications have been made here, and new photographic magnitude determinations are being made with the co-operation of other observatories. Since the zone includes the solar apex and the galactic pole the data are particularly valuable for statistical studies.

106. The Orbit of the Spectroscopic Binary H.D. 15138. By Ruth J. Northcott. Presented by Helen S. Hogg, F.R.S.C.

The elements of H.D. 15138, a double-line spectroscopic binary, have been computed with the University of Toronto electronic computing machine. This star, R.A. (1900) 02h 21.2m, Dec. (1900) $+50°$ 07′, was discovered as a binary from plates taken at Mount Wilson and David Dunlap observatories. Observations from the two observatories were combined in the solution. The stars are F-type dwarfs; the period is just under eleven days, the range is less than one hundred km/sec, and the eccentricity is moderate (0.2). From an analysis of the observations it appears that there is evidence of unequal gamma velocities, which may be interpreted as being caused by atmospheric activity.

107. The Chromospheric K-line of CA II in the Spectrum of 31 Cygni. By A. McKellar, F.R.S.C., L. H. Aller, G. J. Odgers, and E. H. Richardson.

The eclipsing binary star 31 Cygni showed remarkable spectroscopic effects in 1951 as the smaller hot B-type component travelled behind the atmosphere of the cool supergiant K-type component. A study of the growth and decay of the atmospheric line of Ca II at λ3933 has been made from Victoria and Ann Arbor spectrograms. Results to be discussed include data showing that complex structure in the K-line is to be interpreted as arising from separate, discrete moving clouds of gas in the extensive chromosphere of the cool supergiant star and that this chromosphere extends outward from the star's surface farther than a stellar diameter, which is at least 150 times the diameter of the sun. Turbulent velocities in the stellar atmosphere were found to vary from about 10 to 20 km/sec.

108. The Orbit and Spectrum of H.D. 190967. By R. M. Petrie, F.R.S.C.

Radial velocities from 63 single-prism spectra of this eclipsing star give orbital elements as follows:

$P = 6^d.5197$, $e = 0.04$, $\omega = 34°.5$, $V_0 = -16.1$ km/sec, $K_1 = 215$ km/sec.

The velocities of the fainter component show a departure from two-body motion, and a violation of the mass-luminosity relation. The component stars are remarkable; the masses are each about 20 times the sun, the brighter star is of spectrum BO with absolute magnitude −4.1, the fainter is probably O9 with absolute magnitude −3.7.

109. On the Relation between λ4430 and Distance. By Anne B. Underhill. Presented by R. M. Petrie, F.R.S.C.

The equivalent width, $W(\lambda 4430)$, of the interstellar feature at λ4430 is measured in 60 O and early B-type stars. The interstellar reddening of each star is measured by its colour excess E_1 and the distances of many of the stars are found from cluster moduli. Good linear correlations are found between $W(\lambda 4430)$ and E_1, between $W(\lambda 4430)$ and distance r, and between E_1 and r. Least squares solutions of the data give

$$E_1 = (0.15 \pm 0.01)W + (0.01 \pm 0.02),$$
$$r = (0.43 \pm 0.03)W + (0.35 \pm 0.02),$$
$$r = (2.69 \pm 0.14)E_1 + (0.36 \pm 0.04).$$

Here E_1 is in magnitudes, W in angstroms, and r in kiloparsecs. The fact that the last two relations do not go through the origin is an indication that interstellar dust is not uniformly distributed in the plane of the galaxy, although uniformity is a good first approximation.

110. The Light Ratio and the Spectrum of the Secondary Component in the Eclipsing Binary 31 Cygni. By K. O. Wright, F.R.S.C.

High-dispersion spectrograms of the star 31 Cygni were obtained at Victoria during the partial and total phases of the eclipse in 1951 and, later, out of eclipse, in 1952 and 1953. A spectrophotometric comparison of the plates taken during totality with those taken out of eclipse has given a determination of the light ratio at different wavelengths as follows:

λ	3800	4000	4250	4500
α	1.35	0.62	0.27	0.15

The secondary spectrum shows strong hydrogen and helium lines at wavelengths shorter than λ4100, and is classified as about B5.

111. The Moving Cluster in Taurus. By Joseph A. Pearce, F.R.S.C.

New elements for the motion of the Taurus Cluster have been determined.

A least-squares solution of 74 accurate proper motions on the N30 system, by the classical method of Charlier, placed the convergent point at

R.A. 91°.8±0°.65, Dec. +9°.1±0°.25.

The Cluster velocity was found to be 43.2±0.13 km/sec based solely upon Lick Observatory three-prism observations and recent Victoria observations, on the revised Victoria system of wavelengths, of 10 A–G type stars.

Parallaxes and absolute magnitudes were derived for the 142 members of the Cluster. A comparison of these computed luminosities with the Mount Wilson spectroscopic absolute magnitudes of 79 Taurus stars indicates that the latter require a correction of M = +0.33±0.032.

The spatial distribution is spherical and highly condensed as 72 stars (51 per cent) are within 4 parsecs, and 133 stars (94 per cent) within 10 parsecs of the centre.

112. Meteor Echo Durations and Visual Magnitudes. By Peter M. Millman and D. W. R. McKinley, F.R.S.C.

The statistical relation between the radio echo duration and the visual magnitude has

been investigated for approximately 3300 meteors observed on the combined Dominion Observatory–National Research Council programme at Ottawa. Both echo durations and visual magnitudes were reduced to absolute values, defined as those for a meteor in the zenith at a height of 100 km. For meteors in the absolute magnitude range +4 to −2 a straight line relation exists between log absolute duration and the absolute magnitude. For meteors brighter than absolute magnitude −2 the duration does not increase with declining magnitude as rapidly as for the fainter magnitude range.

9.00 a.m.—Sub-section GENERAL PHYSICS—Room 135, McLennan Laboratory. PAPERS 113–119.

113. Atomic Arrangement in Liquid Helium by Neutron Diffraction. By D. M. Hurst, F.R.S.C., and D. G. Henshaw.

The angular distribution of 1.04 A neutrons scattered by liquid helium has been measured over the angular range 3° to 70° for a series of temperatures between 1.65°K and 5.04°K. The scattering patterns show one principal maximum at an angle of 19.6°±0.5° over a large range in liquid density. No marked change accompanies the lambda transition. Radial density distributions, calculated from Fourier transforms of the scattered intensity, show a maximum in the radial distribution at 3.7_4 A for the lowest temperature and at 3.9_0 A for the highest. The average number of neighbours is less than a complete close packed arrangement, in keeping with the randomness expected for a liquid.

114. The Thermal Ionization of Trapped Electrons in Ionic Solids. By J. H. Simpson. Presented by D. W. R. McKinley, F.R.S.C.

The ground state of an electron trapped at a defect of the interstitial ion type in an ionic crystal is determined by a variation method in which the interaction between electron and lattice vibrations is treated on a dynamic basis. The results are compared with static calculations using a self-consistent method and it is shown that for certain ranges of the low- and high-frequency dielectric constants an appreciable difference in energy may occur.

115. Lattice Thermal Conductivity and Irreversibility. By D. K. C. MacDonald and J. S. Dugdale. Presented by G. Herzberg, F.R.S.C.

Since the work of Peierls (Ann. Physik. (Lpz.), *3*, 1929: 1055) it has been accepted that the finite thermal conductivity of a lattice must be attributed to anharmonicity producing interaction between lattice vibrations. Peierls argued further that only through "Umklapp-prozesse," involving interchange of a quantum of momentum with the lattice itself, could the flow of heat be limited. We have found (Dugdale and MacDonald: Phys. Rev., in press, 1955) that a rather simple "classical" expression for the mean free path at higher temperatures ($l \simeq A_0/\alpha\gamma T$: A_0 — lattice constant; α — thermal expansion coefficient; γ — Grüneisen's parameter), suggested by previous investigations of lattice anharmonicity, gives satisfactory agreement with experiment. It seems therefore surprising if a quantal argument is strictly necessary to describe the phenomenon at high temperatures, yet detailed analysis suggests strongly that classical mechanics is unable to describe satisfactorily the diffusion of heat. The difficulty (cf. Lande, Scientific Papers presented to Max Born, Blackie, 1954) of describing irreversible processes by deterministic mechanics is one of long standing.

116. An Attempt to Observe the Specific Heat due to Quadrupole Splitting of Iodine in an Organic Iodine Compound. By J. M. Daniels and J. L. G. Lamarche. Presented by G. M. Volkoff, F.R.S.C.

The specific heats of (99% Mg 1% Co) *P*-iodobenzene-sulphonate and (99% Mg 1% Co) *P*-toluenesulphonate have been measured in the range 0.02°K to 0.5°K. At these temperatures the specific heats C are inversely proportional to T^2; $CT^2/R = 9.0 \times 10^{-6}$ and 4.1×10^{-6} respectively. Cerium magnesium nitrate mixed with these salts was used both as a cooling agent and as a thermometric substance.

The correct interpretation of these results must wait for further experimental data, but tentative conclusions would indicate that the quadrupole splitting of the iodine is about one-quarter that hitherto observed for aromatic iodine.

117. Classical Field Theory of the Superconducting State. By F. A. Kaempffer and R. E. Pugh. Presented by G. M. Volkoff, F.R.S.C.

The superconducting state is described in terms of the electronic plasma in interaction with the electromagnetic potentials. The interaction of the plasma with itself and with the lattice is represented by a potential energy determined so that London's equations are satisfied. The resulting non-linear field equations are solved in linear approximations. There exist four independent modes of vibration of the field variables, corresponding to the plasma oscillations, and one longitudinal and two transverse oscillations of the electromagnetic potentials. The contribution of these modes to the specific heat is discussed.

118. Slow Neutron Spectrometry: A New Tool for Study of the Dynamics of Condensed Systems. By B. N. Brockhouse. Presented by D. G. Hurst, F.R.S.C.

For several years it has been realized that important information not otherwise easily accessible to experiment could be gained by studying energy distributions of initially monoenergetic slow neutrons after scattering from molecules or condensed systems. For crystals such measurements with sufficient resolution would lead directly to the frequency-wave number relation of the normal modes and to their frequency distribution. Energy distributions have been obtained for a number of materials under different conditions, using an initial energy of 0.05 ev. and a crystal spectrometer to analyse the scattered neutrons. Results, particularly those for vanadium metal, will be discussed.

119. The Propagation of Shear Waves in Rubber at Ultrasonic Frequencies. By J. R. Cunningham and D. G. Ivey. Presented by Dr. W. H. Watson, F.R.S.C.

In order to supplement data obtained from a study of bulk wave propagation in various rubbers, velocity and attenuation of shear waves have been studied in the temperature range from −70°C to 20°C, at several frequencies in the megacycle region. This has been done because bulk wave data enables only a combined bulk and shear modulus (and related viscosity) to be calculated. The addition of shear wave data allows each of these quantities to be calculated separately. These results, combined with low frequency measurements, yield information concerning the wide range of variation of the elastic and viscous properties of rubberlike materials.

INDEX

Light-face figures indicate the number of the article, bold-face figures the number of the page.

Alexander, T. K., 16, **12**
Aller, L. H., 107, **34**
Allin, E. J., 74, **26**
Armstrong, D., 30, **15**
Arseneau, D., 34, **16**

Baird, K. M., 75, 76, **27**
Bartholomew, G. A., 18, **13**
Beals, C. S., 2, **9**
Beatty, S., 6, **10**
Bedford, R. E., 83, **28**
Bell, R. E., 26, **15**
Bernstein, H. J., 38, **17**
Bindon, H. H., 43, 48, **19, 20**
Boivin, J. L., 96, 98, 99, 100, 101, 102, **32, 33**
Boivin, P. A., 96, 101, **32, 33**
Brockhouse, B. N., 118, **37**
Broten, N. W., 92, **31**
Brown, H., 89, **30**
Bruce, W. R., 85, **29**

Carman, P. D., 88, 89, **30**
Carroll, P. K., 82, **28**
Chambers, R. G., 65, **24**
Chandrasekhar, S., 72, **26**
Clodman, J., 49, **20**
Cloutier, J. A. R., 28, 29, **15**
Covington, A. E., 92, **31**
Coxeter, H. S. M., 57, **22**
Crawford, M. F., 77, 78, **27**
Crooker, A. M., 83, **28**
Cunningham, J. R., 119, **37**
Cvetanovic, R. J., 33, **16**

Dagg, I. R., 78, **27**
Daniels, J. M., 116, **37**
Denholm, A. S., 91, **30**
Dickson, J. H., 101, **33**
Dickson, J. S., 48, **20**
Douglas, R. H., 42, **18**
Duff, G. F. D., 8, **10**
Dugdale, J. S., 64, 115, **24, 36**
Dulmage, L., 13, **12**
Dyne, P. J., 20, **13**

Elbaum, C., 70, **25**
Embleton, T. F. W., 95, **31**
Evans, I. C., 38, **17**
Ewan, G. T., 24, **14**

Feldman, T., 84, **29**
Ferguson, A. J., 18, **13**
Forst, W., 32, **16**
Foster, J. S., 28, 29, **15**
Freeman, G. R., 31, **16**
Fryer, K. D., 4, **10**

Gagnon, P. E., 96, 97, 98, 99, 100, 101, 102, **32, 33**
Gaizauskas, V., 73, **26**
Giguère, P. A., 39, **18**
Godson, W. L., 47, **19**
Gove, H. E., 18, **13**
Green, B. C., 94, **31**

Haggart, C., 100, **33**
Halperin, I., 4, 13, **10, 12**
Hare, W. F. J., 74, **26**
Hart, J. F., 77, **27**
Hart, K. H., 76, **27**
Harvey, G. A., 92, **31**
Heard, J. F., 105, **34**
Hedgcock, F. T., 63, **23**
Henrikson, A., 28, 29, **15**
Henry, W. G., 62, **23**
Henshaw, D. G., 113, **36**
Herzberg, G., 72, **26**
Hogg, H. S., 104, **33**
Hooper, A. W., 48, **20**
Hoskin, F. C. G., 36, **17**
Hurst, D. G., 113, **36**

Ivey, D. G., 119, **37**

Jackson, J. D., 25, **14**
James, R. D., 9, **11**
Jennings, S. A., 61, **23**
Johns, H. E., 85, **29**
Johns, M. W., 17, **12**

Kaempffer, F. A., 117, **37**
Katzman, J., 22, **14**
Keirstead, K. F., 97, **32**
King, R., 68, **25**
Knox, J. L., 50, **20**
Krause, L., 84, **29**

Laflamme, Y., 99, **32**
Lamarche, J. L. G., 116, **37**
Lambek, J., 52, **21**
Lane, N. D., 55, 56, **21, 22**
Lee, R., 44, **19**
Leitch, L. C., 35, **17**
Lipsett, F., 68, **25**
Litherland, A. E., 18, **13**
Liu, I. D., 39, **18**

MacDonald, D. K. C., 64, 115, **24, 36**
MacDonald, R., 102, **33**
MacDonald, R. E., 78, **27**
McIntyre, D. P., 45, **19**
McKellar, A., 107, **34**
McKinley, D. W. R., 112, **35**
McLay, A. B., 87, **30**

McMahon, G. W., 15, **12**
McMullen, C. C., 17, 12
MacRae, D. A., 3, 103, **9, 33**
Mann, K. C., 14, 15, **12**
Marr, G. V., 79, 27
Marshall, J. S., 41, **18**
Mateer, C. L., 46, 19
Mathai, P. M., 84, **29**
Medd, W. J., 92, **31**
Mendelsohn, N. S., 5, **10**
Milley, D. C., 14, **12**
Millman, P. M., 112, **35**
Mooser, E., 66, **24**
Moser, L., 10, 11, 11
Moser, W. O. J., 58, 59, 60, 22, 23
Munro, L. A., 40, 18

Newbold, B. T., 97, **32**
Nicholls, R. W., 79, 80, **27, 28**
Northcott, R. J., 106, **34**

Odgers, G. J., 107, **34**
Olivier, C. A., 102, **33**

Paul, E. B., 18, **13**
Pearce, J. A., 111, **35**
Pearson, W. B., 67, **24**
Petrie, R. M., 1, 108, **9, 34**
Pickup, E., 21, **14**
Pugh, R. E., 117, **37**

Ramsay, D. A., 81, **28**
Redhead, P. A., 86, **29**
Richardson, E. H., 107, **34**
Risi, J., 34, **16**
Robinson, G. de B., 7, **10**
Robson, J. M., 19, **13**
Rogers, J. L., 62, **23**
Romanko, J., 84, **29**
Rooney, P. G., 12, **11**
Rose, D. C., 22, **14**
Rutter, J. W., 71, **25**

Schneider, W. G., 37, **17**
Shepherd, G. G., 84, **29**
Sherk, F. A., 56, **22**
Simpson, J. H., 114, **36**
Skarsgard, H. M., 26, **15**
Smith, W., 43, **19**
Spinks, J. W. T., 94, **31**
Stevens, B. A., 93, **31**
Subbarao, M. K., 87, **30**

Thomas, M. K., 51, **20**
Thompson, A. L., 27, **15**
Trick, G. S., 36, **17**

Underhill, A. B., 109, **35**

Volkoff, G. M., 23, **14**

Warren, J. B., 16, **12**
Washington, R. A., 40, **18**
Watson, D. C., 98, **32**
Watson, P. K., 90, **30**
Welsh, H. L., 73, **26**
Williams, I. R., 17, **12**
Winegard, W. C., 69, **25**
Winkler, C. A., 30, 31, 32, **15, 16**
Woods, S. B., 66, **24**
Wright, K. O., 110, **35**
Wyman, M., 10, **11**

Yaffe, L., 28,

Zassenhaus, H., 53, 54, **21**
Zauhar, J., 96, **32**

SECTION IV. GEOLOGICAL SCIENCES

Monday, June 6

11.00 A.M.—Meeting of the Section.

1. Presidential Address by J. B. Mawdsley, F.R.S.C.

2.00 P.M.—Meeting of the Section.

2. Age of the Princeton Group, Southwestern British Columbia. By Loris S. Russell, F.R.S.C.

The Princeton Group is a thick series of sedimentary and volcanic rocks of Tertiary age occurring in the Similkameen and Tulameen valleys near Princeton, B.C. On the basis of fossil plants and insects the sedimentary rocks have been correlated with the Upper Oligocene or Lower Miocene. The associated fossil fishes are similar to those of the Florissant shales of Colorado, now recognized to be of Early or Middle Oligocene age. From a coal seam relatively low in the sequence fossil mammals have been obtained which cannot be younger than Middle Eocene. These discrepancies can be partially eliminated if we assume that the upper part of the Princeton group is of Middle Oligocene age and the lower part of Middle Eocene age.

3. Archean Monazite in Beach Concentrates, Yellowknife Geologic Province, Northwest Territories, Canada. By R. E. Folinsbee. Presented by P. S. Warren, F.R.S.C.

Gneiss-derived monazite occurs as a minor constituent of small, well-sorted beach placers formed from esker sands on the south shore of Yamba Lake, Yellowknife geologic province, Northwest Territories. Magnetite, almandite garnet, and ilmenite are the dominant minerals of the monazite-bearing beach concentrate. Other heavy minerals identified include, andalusite, apatite, biotite, brookite, epidote, hornblende, kyanite, olivine, pyroxenes, rutile, scheelite, sphene, sillimanite, spinel, staurolite, tourmaline, and zircon; of these only kyanite has not previously been recognized in rocks of the Yellowknife province. The injection gneiss or migmatite, source of the monazite, has been assigned to the Archean (2200 million years) on the basis of field relations confirmed by potassium-argon and other age-dating methods. The relation of the gneiss to other rocks of the Yellowknife continental nucleus has been established.

4. Frenchman Formation of Eastern Cypress Hills, Saskatchewan. By W. O. Kupsch. Presented by F. H. Edmunds, F.R.S.C.

In the eastern Cypress Hills the Frenchman formation of Upper Cretaceous age consists of a clay facies and a sand facies. Lithological studies of sections show that either facies may form the lowest unit of the Frenchman formation and that they may alternate vertically. Equivalency of the two facies is also suggested by similar fossils in both.

The distribution of the Frenchman formation covers a larger area than previously assumed, as certain sands, formerly interpreted as belonging to the Eastend formation, are assigned to the Frenchman formation because of their fossil content. Differences in grain size, colour, accessory minerals, bedding, and other characteristics can be used to distinguish Eastend formation sands from the sand facies of the Frenchman formation.

The lower boundary of the Frenchman formation is a surface of erosion, the upper contact is abrupt but conformable.

5. Biogeochemistry in Northern Latitudes. By Harry V. Warren, F.R.S.C., and Robert E. Delavault.

In northern latitudes there are some areas where there may be permafrost and others where soils may not be present or are poorly developed. In such areas it is not practical to use soil sampling in any search for buried ore deposits.

Preliminary work has indicated that biogeochemical methods can be successfully employed in northern latitudes. Birch (*Betula papyrifera* and *B. glandulosa*), Labrador Tea (*Ledum groenlandicum*), Spruce (*Picea mariana* and *P. glauca*), and Willow (*Salix* sp) have all been collected in arctic or near-arctic conditions and found to be capable of reporting anomalously high zinc and copper contents in underlying rocks.

6. Archaeocyatha from the McDame Area of Northern British Columbia. By Vladimir J. Okulitch, F.R.S.C.

Archaeocyatha from the Lower Cambrian Atan group from the McDame area of northern British Columbia are described. The fossils occur in a limestone band at approximately 129° 00′ longitude and 59° 15′ north latitude.

Three orders, the Ajacicyathida, the Metacyathida, and the Syringocnemida of the phylum Archaeocyatha are represented. Six new species are described: these are: *Archaeocyathus loculiformis, Archaeocyathus borealis, Archaeofungia obliqua, Metacoscinus gabrielsensis, Metacoscinus deasensis,* and *Syringocyathus canadensis.* The fauna has several species in common with that of the Donald formation of the Purcell Mountains, and indicates that in part at least, the Atan group is Lower Cambrian in age.

7. Precambrian Nomenclature. By J. E. Gill, F.R.S.C.

A critical discussion of the use of names in the description of Precambrian rock assemblages in Canada.

8. The Lower Cretaceous Flora of Northern Alaska. By J. Stewart Lowther. Presented by Pierre Dansereau, F.R.S.C.

Fossil plants and coal are widely distributed in the Chandler formation of the Nanushuk group. The specimens which have thus far been collected show a flora composed primarily of ferns, cycadophytes, ginkgophytes, and conifers. The angiosperms are represented only by a few fragmentary dicotyledonous leaves of a primitive type. This assemblage is definitely one of arctic affinities, being quite closely related to the lower Cretaceous floras of Svalbard and Franz Josef Land, as well as to those of western Greenland, Japan, China, Korea, and Siberia. On the basis of these relationships the age of the flora is determined to be middle lower Cretaceous.

9. The Age of the Fossil Hill Coral Reefs. By M. Y. Williams, F.R.S.C.

The extensive biostromes of corals, stromatoporoids, and associated forms exposed on Fossil Hill, Manitoulin Island, have generally been correlated with the Niagara Limestone (Lockport) formation of New York State. Reefs of similar character and age occur in Kentucky, Michigan, Lake Timiskaming, Manitoba, the Rocky and Franklin Mountains,

and at many localities in northern Canada. Similar reefs in Gotland and England are found in rocks of Wenlock age.

In a recent paper T. E. Bolton (Geological Survey of Canada Paper 53–23) proposes to correlate the "Fossil Hill formation" with the Reynales (Lower Clinton) formation of New York. His argument is mainly based on stratigraphy.

The writer claims that this correlation is untenable on faunal evidence and cannot be proved stratigraphically. The most northerly determined Clinton outcrop is nearly 160 miles from Fossil Hill, and for 20 miles south of Fitzwilliam Island all but the highest beds of the Lockport formation are covered by the waters of Georgian Bay.

10. The Patterns of Features formed by Pleistocene Ice in Part of Northern Canada. By J. Tuzo Wilson, F.R.S.C.

Maps made during twenty years of plotting features from air photographs show that Pleistocene ice moved outwards from divides. Mary James Downie, Anita Evans, and the writer found three divides extending from Yathkyed Lake to Churchill, Wager Bay, and Great Bear Lake respectively. They also found evidence for an ice stream down the Mackenzie valley fed by Keewatin and Cordilleran ice. Mary Douglas, N. R. Drummond, and Joan Ruddell found a U-shaped divide inland around Ungava Bay. Ann Paterson, D. H. Hall, the writer, and others find that the Patrician ice moved out of Hudson Bay across Ontario. (Defence Research Board gave support.)

11. Uranium-Rich Thorianite from Pontiac County, Quebec. By John S. Stevenson, F.R.S.C., and Louise Stevens Stevenson.

Thorianite, a radioactive mineral not previously recorded from Quebec, has been found in Grenville limestone in Huddersfield Township, Pontiac County. It occurs as black grains 0.1 mm. to 0.2 mm. in diameter widely scattered in a matrix of coarse crystalline limestone. The mineral was first concentrated, and then identified by its crystal form, X-ray fluorescence spectrum, and X-ray diffraction pattern. The thorianite is itself uranium-rich, and is not associated with uranite.

A uranium-bearing hydrous thorite has also been identified, associated with forsterite and calcite in adjacent lime-silicate rock.

12. Some Ordovician Species of "Halysites." By G. Winston Sinclair. Presented by J. F. Caley, F.R.S.C.

The coral family Halysitidae is an unnatural group of species belonging to separate lineages, each of which happens to have assumed a chain-like habit of growth. Two species from the Simard beds of the Saguenay region, Quebec, and two from the Selkirk member of the Red River formation of southern Manitoba are described in detail. All but one of these species is new, and they are assigned to three genera. An unsuspected plasticity in growth is described in the Manitoba material.

13. Activation Analysis of Rocks, Progress Report. By G. M. Brownell, F.R.S.C., and H. D. B. Wilson.

A start has been made in the analysis of certain abundant elements in rocks and minerals by measuring the induced gamma radiation produced when a sample is bombarded by neutrons. Coarsely crushed rock is placed in a container and exposed to either fast or slow neutrons for a fixed period of time depending upon the element to be analysed. The neutron bombardment produces radioactive isotopes of limited decay time and different energy

levels. This induced radiation is proportional in its intensity to the percentage of the element in a sample and is measured with a scintillation counter. Elements most amenable to this method of analysis with the present equipment are silicon, aluminum, sodium, and potassium, with possible extension to other rarer elements in minerals and ores.

Tuesday, June 7

9.00 A.M.—Symposium on "The Grenville Problem."

14. Grenville Region of Quebec. By F. Fitz Osborne, F.R.S.C.

The type locality for the Grenville series is in Logan's original Laurentian area and is near the east side of a north-trending belt, about 100 miles wide. This belt contains "typical Grenville" with abundant limestone and paragneisses and is the part of the Quebec Grenville sub-province that is most similar to the Haliburton and Bancroft areas and the northwestern Adirondacks, although it is unlike them in many respects.

Northeast of the type locality, formations with some thin layers of crystalline limestone, some quartzites, or some garnetiferous gneisses have been called Grenville or Grenville-type. It is certain that some of these rocks are not Grenville, being meta-volcanic and meta-sedimentary rocks of the Timiskaming sub-province. Some "Grenville" rocks probably have still other correlatives.

The igneous geology of the Quebec Grenville sub-province is complex and, with some exceptions, correlative igneous sequences are difficult to determine. Many of the diagnostic petrographic features of the igneous rocks are probably the result of metamorphism. This metamorphism appears to be younger than the anorthosites but older than certain granite batholiths.

15. Grenville of New Quebec. By W. G. Robinson. Presented by J. T. Wilson, F.R.S.C.

Structure and lithology indicate that the Grenville mountains extended past Lake Mistassini to Lake Melville. Proterozoic formations at Lake Mistassini, the Otish Mountains, the south end of the Labrador trough, and around Seal Lake were folded by the Grenville orogeny. At Lake Mistassini and Seal Lake the mountain front is marked by thrust faults. The formations east of the Labrador trough are lithologically similar to those of the Grenville province, but are believed to be part of an older province.

16. Differing Aspects of the Grenville Front in Northern Quebec. By E. R. W. Neale. Presented by J. F. Henderson, F.R.S.C.

Northeast of Lake Mistassini Basin, the Grenville Front is a linear fault zone along which northeast-striking structures of the Grenville province have been brought into abrupt contact with east-striking structures of the Superior province. Here, the Superior province acted as a stable craton during Grenville orogeny.

In contrast, southeast and south of Chibougamau Lake, the Grenville Front is an irregular feature characterized by: (1) gradual increase in metamorphic grade southeastward, (2) granitic intrusion and/or replacement, and (3) complex northeast-striking structures superimposed on east-striking structures of the Superior province. Here, the Superior province has been deformed along northeast lines by forces associated with Grenville orogeny and, hence, exemplifies folding of basement rocks in a foreland zone as described by G. M. Lees (1953).

17. Grenville Region of Ontario. By D. F. Hewitt. Presented by D. R. Derry, F.R.S.C.

The Grenville region of the central part of eastern Ontario can be divided into four major structural units: the Haliburton-Hastings-Madawaska highlands; the Hastings basin; the Kaladar-Dalhousie trough, and the Frontenac axis. The highlands and the Frontenac axis are terrains of high grade metamorphic gneisses characterized by rocks of the amphibolite-granulite facies, where intrusives are mainly concordant, and primary sedimentary and volcanic structures are largely obliterated. The Hastings basin and Kaladar-Dalhousie trough in part are terrains of low to intermediate metamorphic grade including schists, argillites, and well-bedded "blue" limestones. Intrusives may be discordant. Primary sedimentary and volcanic features are well preserved and normal stratigraphic methods apply, in part.

18. Major Magnetic Features of the Grenville Sub-Province of Southern Ontario. By L. W. Morley. Presented by S. C. Robinson, F.R.S.C.

A composite aeromagnetic map of an area of about 8,000 square miles in the Grenville sub-province of southern Ontario has been compiled. An attempt is made at a regional interpretation of the data although comparatively little geology is known with which to compare the magnetic information. Comparisons with photogeologic and gravity data are drawn. Novel problems which arise in interpretations of magnetic data over such broad areas are discussed.

19. The Bearing of Age Determination on the Relationship between the Keewatin and Grenville Provinces. By H. A. Shillibeer and G. L. Cumming. Presented by J. T. Wilson, F.R.S.C.

Over 50 age determinations from veins and pegmatites suggest that the Grenville geological province is between 800 to 1300 million years old. No older ages have been reported. More than 20 determinations on pegmatitic and vein minerals from the Keewatin province give ages of over 2000 million years. A few veins but no pegmatites give younger ages in both the Keewatin and Grenville belts.

This evidence supports the view that continents have grown by marginal accretion, a mountain belt at a time.

20. Apropos the Grenville. By A. E. Engel. Presented by J. B. Mawdsley, F.R.S.C.

2.00 P.M.—Symposium on "The Grenville Problem" (contd.).

21. The Relationship of the Timiskaming and Grenville Series. By M. E. Wilson, F.R.S.C.

Many years ago, the writer pointed out that the belt of granitic and other gneisses that lies along the northwest border of the Grenville sub-province is the core of a denuded mountain chain having geanticlinal relationships to Timiskaming and Grenville geosynclines on either side. The low gravity of this belt, as determined by G. D. Garland, lends some support to this hypothesis. The potassic, granitic rocks of this Precambrian mountain chain intrude both the Timiskaming and the Grenville series and are overlain unconformably

by the sediments of the Cobalt series. If, therefore, the great unconformity that underlies the Cobalt series be regarded as the dividing line between the Archean and Proterozoic eras, then the Grenville series is of Archean age. Although it is probable that the Timiskaming and Grenville series were both deposited in the intertectonic erosion interval that preceded the post-Timiskaming-Grenville mountain building, their lithological character is so different that it is scarcely possible that they could have been deposited contemporaneously. It is concluded that the Grenville series was deposited considerably later in the intertectonic erosion interval than the Timiskaming.

22. Correlation of Rigid Units, Types of Folds, and Lineation in a Grenville Belt. By A. F. Buddington. Presented by J. B. Mawdsley, F.R.S.C.

There are in the Adirondacks several relatively rigid units between which the rocks have a wedge structure with overturned isoclinal folds on each flank and their axial planes dipping towards each other.

There are three major relationships of linear structure:

(1) foliation with linear structure subparallel to the regional trend, characteristic of open to steeply inclined isoclinal folds and in part of overturned isoclinal folds; (2) foliation with linear structure sub-parallel to minor fold axes and sub-perpendicular to the trend of major folds, especially developed in strongly overturned isoclines; (3) no planar structure but only linear structure parallel to major fold axes and especially developed on the crest of plunging noses of anticlines or in the keel of tight synclines.

23. Fold Structures in the Blue Mountain Nepheline Syenite and Associated Rocks. By D. R. Derry, F.R.S.C., and C. V. G. Phipps.

Geological mapping on the property of the American Nepheline Company and a reconnaissance of the surrounding area give an example of the folded structures typical of the Grenville tectonic province.

The nepheline syenite occurs as a part of a stratigraphic unit folded with the underlying and overlying series of altered siliceous and calcareous sediments. The typical structures, both in the vicinity of the nepheline-bearing formation and elsewhere, are relatively short, domal anticlines and complementary synclines terminated or modified by cross flexures nearly normal to the fold axes. These cross flexures mark sharp reversals of pitch of the main folds.

In areas of granitized sediments the cores of domes of anticlines are the loci of the most complete granitization.

24. Structures in the Clare River Area and the Problem of Granitization. By C. A. Burns. Presented by J. W. Ambrose, F.R.S.C.

The succession of Grenville-type metasedimentary, metavolcanic, and granitic gneisses near Tweed, Ontario, is interrupted by two, probably three unconformities; earlier subdivisions based on one unconformity are unsatisfactory. Regional medium to high rank metamorphism of the series was succeeded by additive contact metamorphism and that by hydrothermal alteration.

The gneisses are complexly folded about axes that strike and plunge, northeast. The central structure, the Clare River syncline, involves mainly metasediments and metavolcanics. It is flanked on both sides by granitic gneisses which on the southeast form the Mellon Lake anticline and on the northwest more complicated, dragfold-like structures. The granitic gneisses are probably of metasomatic origin; confused structures near Mellon Lake may indicate local rheomorphism.

25. Geological Implications of Gravity Anomalies over the Grenville and Adjoining Regions. By L. G. D. Thompson, G. D. Garland, and M. J. S. Innes. Presented by J. T. Wilson, F.R.S.C.

The results of gravity measurements by the Dominion Observatory in Quebec south of latitude 52° indicate Bouguer anomalies ranging from positive values of 40 milligals to negative values of 80 milligals within a relatively short distance. The chief positive trend lies along, and south of, the northern boundary of the Applachian province, forming a nearly continuous belt from the Eastern Townships to the end of Gaspé. It is suggested that this is evidence of a sheet of ultrabasic material thrust through the overlying rocks. By contrast, no striking gravitational effects are observed at the northern boundary of the Grenville province, many trends apparently crossing the boundary without interruption. Known bodies of anorthosite give large negative anomalies, indicating that they are lighter elements of the crust, and also that they extend to depth.

26. Trace Element Study of Some Granitic Masses in the Grenville Sub-Province, Ontario. By J. E. Hawley, F.R.S.C.

A progress report is made on spectrographic results obtained on some twenty granitic masses in the Grenville sub-province occurring in an area extending from Brockville to Wilberforce, Ontario.

Qualitative data on both bulk samples and heavy mineral concentrates are augmented by quantitative results for Cu, Ni, V, Mo, and Zr. Variations in the composition of the heavy minerals appear most useful and allow some distinctions and certain correlations to be made between masses, some of which differ also in K_2O : Na_2O ratios. Eventual correlation of these results with potassium-argon ratios will aid in evaluating trace element studies of this type.

Wednesday, June 8

9.00 A.M.—Joint Session of Sections III and IV. Symposium on "Geochronology and Geophysics."

27. A Simplified Method of Liquid Scintillation Counting of Natural Radiocarbon. By B. L. Funt, R. W. Pringle, S. Danyluk, and W. Turchinetz. Presented by K. J. McCallum, F.R.S.C.

Methanol synthesized from sample carbon has been utilized in a liquid scintillation technique for C^{14} age determinations. The methanol was obtained in a simple single step: reduction of CO_2 by $LiAlH_4$. The results obtained with this technique are compared with our previous work involving the synthesis and use of toluene. An analysis of background and shielding problems is presented.

28. Carbon^{14} Dating at the University of Saskatchewan. By K. J. McCallum, F.R.S.C.

The experience at the University of Saskatchewan with the solid-carbon counting technique for age determination by the Carbon^{14} method will be reviewed. The many limitations and difficulties which have been encountered will be discussed. Some of these can be

overcome, but it is concluded that techniques which do not involve the preparation, handling, and counting of solid samples have considerable and important advantages.

29. Screen Wall and Gas Proportional Counters used in Carbon^{14} Dating. By J. E. Blanchard. Presented by W. H. Watson, F.R.S.C.

The sensitivity, precision, sample size, sample preparation, and counting time for screen wall and gas proportional counters will be compared. It is concluded the gas proportional counter is superior. The application of these methods to geological and biological problems in Nova Scotia will be discussed.

30. The Geological Age Determination Programme at the Geological Survey of Canada. By S. C. Robinson, F.R.S.C.

The programme has been undertaken to provide determinations of age in non-fossiliferous rocks. Units now installed and in operation are: a mass spectrometer providing resolution of our mass unit in 300; an X-ray spectrograph; a 21-foot spectrograph; a flame photometer; a zircon extraction laboratory; a lead tetra-methyl vacuum line; and ancillary chemical equipment. A high-vacuum line for extraction of argon and a combustion furnace and vacuum line for preparation of SO_2 and CO_2 are under construction. Ages based on U/Pb and Th/Pb ratios, using combined X-ray spectrograph and mass spectrograph analyses, have been determined for about 60 samples. It is hoped that ages based on K^{40}/A^{40} and S^{34}/S^{32} ratios will be computed this year.

31. Report of the Committee on Precambrian and Related Dating. By J. B. Mawdsley, F.R.S.C., and R. M. Farquhar.

Progress made during 1954 on the improvement of techniques, accuracy, and ranges of the various methods of dating Precambrian rocks and minerals is outlined. The presently available facilities for making age determinations are described, and published ages of material from Canadian Precambrian areas are reviewed. A list of recently dated material and a bibliography covering references to Canadian samples are appended.

32. Indications from Isotopic Analyses of the Sources of Some Lead Ores. By R. D. Russell. Presented by W. H. Watson, F.R.S.C.

Methods so far used for dating galenas by means of their isotopic constitution have depended on assumptions regarding the homogeneity of the source rocks and on the constancy of the lead-uranium ratio in those rocks throughout the history of the earth. These methods have given ages which agree with uranium ages and they have provided important information about the nature of the source rocks.

A new approach to this problem has been developed which avoids most of the assumptions previously used. This method yields ages which differ only slightly from those obtained by the previous methods, and which support the validity of the assumptions which had been made.

33. Canadian Participation in the International Geophysical Year 1957–1958. By Frank T. Davies, F.R.S.C.

Canadian participation in the International Geophysical Year is expected to be greatest in upper atmospheric physics, meteorology, and glaciology. A high level of solar activity with consequent intense geophysical activity is expected in 1957–8.

Many improved techniques of measurement and some quite new ones have become available since the last large international co-operative effort in geophysics in 1932–3.

As Canadian territory includes large sectors of some of the regions selected for special attention, the northern polar and auroral zones in particular, the Canadian contribution to IGY should be substantial.

34. The Palaeomagnetism Controversy: Geologic Aid or Scientific Curiosity? By L. W. Morley. Presented by S. G. Robinson, F.R.S.C.

Opinion is sharply divided as to whether anomalous directions of remanental magnetism in rocks are due on the one hand to the crystal structure and chemical composition of the contained ferromagnetic minerals or on the other hand to the rotation and translation of rock formations, en masse, by geological forces after consolidation, combined with the effect of an earth's magnetic field which has been periodically changing direction throughout geologic history.

While physical and mineralogical explanations are being sought on microscopic and submicroscopic scales, attempts are also being made to prove by statistical studies of remanence directions in the field that the latter premise is correct for some formations.

Positive evidence in connection with problems of crustal shortening, continental drift, and top determinations of beds should be forthcoming from this method.

Even assuming that only a few rock formations are magnetically stable, in that they act according to the latter premise, the usefulness of this phenomenon as a geologic aid would still be important.

35. Gravity in the Sudbury Basin and Vicinity. By A. H. Miller, F.R.S.C. and M. J. S. Innes.

The results of some 500 measurements of gravity in the Sudbury area are presented. It is shown that the principal trends and major features of the gravity field are largely controlled by the surface densities of the rock formations. The anomalies, for instance, are quite variable over the Killarney granites and gneisses to the southeast of Sudbury, and are directly related to density changes within these masses. Gravity maxima that persist along the southern boundary of the basin are largely due to the basic phase of the Sudbury irruptive and to the Stobie formation. The variation in gravity over the Mississagi quartzite provides an estimate of the thinning of this formation towards the north.

The gravity field along certain profiles over the basin is analysed and compared with anomalies calculated for various possible configurations of the irruptive at depth.

36. Gamma Ray Absorption in Rocks. By R. J. Uffen, W. B. Muir, and J. G. Tanner. Presented by A. D. Misener, F.R.S.C.

Measurements have been made of the absorption of a collimated beam of γ rays from a $Cobalt^{60}$ source in water, limestone, and magnetite ore. The measured absorption coefficients are compared with the computed values for Compton scattering and the known chemical composition of the rocks. Preliminary measurements of the build-up factor due to multiple scattering above a point source in a semi-infinite medium are presented.

37. The Physics of Orogenesis in the Light of New Seismological Evidence. By A. E. Scheidegger. Presented by J. T. Wilson, F.R.S.C.

During the past twenty years, many studies of the displacements which have taken place during the occurrence of an earthquake in its focus have been published by various authors.

In the present paper, the results of these studies have been collected and their bearing upon the physics of orogenesis has been analysed. It will be seen that the main features of the displacements within the Earth's mantle and crust are first, that they are localized in almost planar zones dipping at some intermediate angle beneath recent mountain and island belts; secondly, that the material exhibits the characteristics of an elastic after-effect; and thirdly, that the differential displacements are to a large extent horizontal (transcurrent), i.e. *not* parallel to the dipping planar zones.

A renewed discussion of the possible mechanics in the Earth's mantle and crust shows that there is seemingly no known mechanical model-material which would reproduce the displacements as they are found in the Earth. It might therefore be necessary to postulate a new type of model-material with a mechanical behaviour not heretofore encountered in the laboratory. What is required is a mechanical material in which, during failure, the direction of the differential displacements would not coincide with the surface of rupture.

The ultimate elucidation of the process of orogenesis depends on the theoretical understanding of the mechanical behaviour of the material in the Earth's mantle under the there prevailing conditions, which has not yet been achieved.

SECTION V. BIOLOGICAL SCIENCES

Monday, June 6

11.00 A.M.—Business Meeting of Section (Room 7, Botany Building).

2.00 P.M.—Meeting of Section (Room 7, Botany Building). Papers 1–5.

1. Presidential Address: The Balance of Bacterial Virulence. By E. G. D. Murray, F.R.S.C.

It is propounded that virulence is the resolution of a complexity of processes contributed by both parasite and host. Reasons are adduced why this interpretation is more satisfactory than the simpler old concept of virulence as a singular property of pathogenic bacteria. The change in principle reflects notions on conditions of parasitism and pathogenicity suggestively.

2–5. Symposium on Problems of Biological Research and Education.

2. Whither Biological Research? By W. H. Cook, F.R.S.C.

The over-all research effort in the life sciences is determined by the funds available and not by the need, or lack of trained personnel. With direct or indirect industrial support the physical sciences have recruited over five times as many workers from the same population. The smaller economic units served by the life sciences leave the state responsible for biological research and, unlike education, research is not accepted on faith. The comparatively slower tempo of biological, as compared with physical science, also influences both student and public. An increased demand for biological research at the cellular and molecular levels is anticipated but a substantial portion of this need may be filled by personnel trained in the physical sciences.

The number of students entering graduate work in biology is judged adequate to fill the positions available, although the situation varies between specialties. There are two important losses: (1) an appreciable number must leave Canada to obtain graduate training and many do not return; (2) limited employment opportunities in research specialties divert trained personnel to other duties. The first loss can be reduced by building adequate research centres in Canadian universities, if necessary at the expense of existing post-graduate fellowships. The second loss could be minimized if more attention were given to training in the branches of biology offering the best opportunities for employment in Canada.

3. The Support of Biological Research in Canadian Universities. By Kenneth C. Fisher, F.R.S.C.

The importance and extent of the financial support of graduate training from sources outside the universities will be discussed. This will lead to a comparison of the methods by which such support is provided in Canada, the United States, and the United Kingdom with emphasis on the administrative arrangements which govern the use of such support. The practical importance of stability and continuity of support will be reviewed and attention will be drawn to the possibility of increasing the usefulness of the funds available.

4. Undergraduate Biology. By R. D. Gibbs, F.R.S.C.

5. The Need for Biology Teachers in Secondary Schools. By A. H. Louden. Presented by J. R. Dymond, F.R.S.C.

Tuesday, June 7

9.00 A.M.—Meeting of Section (Room 7, Botany Building). Papers 6–15.

6. On the Content of Ecology. By W. A. Clemens, F.R.S.C.

In reviewing some of the immense volume of literature in the field of ecology it would appear that ecologists may not be in agreement as to the content of ecology or as to the interrelations of ecology with other divisions of biology. The present paper is a contribution towards a possible clarification of the situation.

7. Geographic Variations in the European Area of *Cistus ladaniferus*. By Pierre Dansereau, F.R.S.C.

Mass collections of *Cistus ladaniferus* L. were made throughout its European range so as to establish the relative morphological variability of populations in areas with a different vegetational history. This eu-mediterranean species, which comes in contact with desert formations in North Africa, is or has been exposed to various influences: the Atlantic in Portugal, the low montane in France and Spain, and the steppe in central Spain. Contamination through hybridization with *Cistus laurifolius* L. must also be accounted for. The exact ecological conditions prevailing in its habitats, the dynamic status of the present regional vegetation, and the climatic shifts of the formations where the species occurs are described and evaluated.

8. The Elongation of Fusiform Initials in the Cambium of White Cedar (*Thuja occidentalis*). By M. W. Bannan, F.R.S.C.

Fusiform initials are highly individualistic in rate and extent of elongation, exceedingly few conforming to the mean. Data from many hundreds of cells, however, reveal a predominance of basipetal elongation in aerial parts of the tree.

9. The Genetics of Pines: An Evaluation of Multiple Factors for Growth Rate. By A. H. Hutchinson, F.R.S.C.

Pines show a definite segregation and recombination of genetic factors. Growth rate data obtained from the hybridization experiments at the Institute of Forest Genetics, Placerville, California, are evaluated on a basis of the multiple factor hypothesis, in one case as complementary factors and in the other as additive alleles which contribute, multiplicatively, towards stem volume.

10. The Diet and Parasites of Prehistoric Huaca Prieta Indians as determined by Dried Coprolites. By Eric O. Callen and Thomas W. M. Cameron, F.R.S.C.

Examination of human coprolites collected by the American Museum of Natural History from middens in Peru dating from about 2500–1200 and 800–500 B.C., showed that the diet of these early Americans consisted mainly of beans, peppers, cucurbits, mussels, and fish. Clams, sea-urchins, and crabs, as well as sundry fruits, were also eaten. As this was not only a pre-maize but a pre-ceramic culture, cooking appeared to be of the roasting type. In one specimen (dated by radio-carbon determinations by Junius Bird as between 3000–1200 B.C.) there occurred numerous objects which may have been the eggs of a species of tapeworm of the genus *Diphyllobothrium*.

11. Synthesis and Metabolism of C^{14}-labelled Glucose, Galactose, Xylose and Arabinose in Wheat. By G. Krotkov, F.R.S.C., Lillian Cowie, and G. B. Reed, F.R.S.C.

Five-day-old wheat seedlings were illuminated in a closed chamber for eight days in the presence of $C^{14}O_2$. At the end of this period plants were extracted with ethanol. The alcohol insoluble residue was hydrolysed with HCl and from this hydrolysate were chromatographically separated radioactive glucose, galactose, xylose, and arabinose.

The sugars so obtained were fed to two-week-old wheat plants, and their transformations into each other, incorporation into hemicellulose, and cellulose fractions as well as contribution towards respiration were determined.

12. The Effect of Penicillin on the Uptake and Respiration of C^{14}-labelled Glucose and Glutamine by Growing and Non-Growing Cultures of *Staphylococcus aureus* 6538. By R. G. S. Bidwell, P. V. Vittorio, G. Krotkov, F.R.S.C., and G. B. Reed, F.R.S.C.

Radioactive glucose or glutamine were supplied to growing and non-growing cultures of *S. aureus* 6538 in the presence of various concentrations of penicillin. Total CO_2 and the $C^{14}O_2$ respired were determined, and the uptake and distribution of activity between the alcohol soluble and insoluble fractions of the cells were determined.

Penicillin had different effects on the distribution of active carbon from either glucose or glutamine in both growing and non-growing cells. It stimulated glucose respiration and suppressed glutamine respiration, but total CO_2 production was unaffected. It is suggested that penicillin does not affect cell metabolism as a whole, but acts only at two or more specific points.

13. Are Halophilic Bacteria Physiological Artifacts? By N. E. Gibbons. Presented by W. H. Cook, F.R.S.C.

Several properties of halophilic bacteria indicate that they are a distinct group. Their requirement for sodium chloride cannot be replaced by non-electrolytes and in many species even by other electrolytes. The intracellular salt concentration is less than that of the medium and, since their various enzymes operate optimally in salt concentrations ranging from 0 to 2 M, there may be a salt gradient within the cell. Many halophiles have a sticky extracellular layer of deoxyribonucleic acid which may be removed without affecting the viability of the cells. These and other differences will be discussed in relation to the concept of halophilism.

14. An Additional Interpretation of the Effects of pH Variation upon Enzymatic Reactions. By J. Ross Colvin. Presented by W. H. Cook, F.R.S.C.

It is suggested that the reversible effects of pH variation upon the properties of enzymatic systems may be explained by expansion or contraction of the enzyme molecule under Coulomb forces, as well as by the current hypothesis of a direct effect of ionizing groups upon the active centre. Experimental observations of maxima in the pH-activity function, variation of K_m and K_i with pH, effects of pH upon heat inactivation of enzymes, and ionic strength effects of buffers are shown to be consistent with the suggestion. Evidence for the expansion (or contraction) of proteins with pH variation is reviewed and the resulting limitations upon interpretation of experimental data are indicated.

15. The Effect of a Narcotic on Growth and Respiration of L Strain Mouse Connective Tissue Cells. By S. Dales and Kenneth C. Fisher, F.R.S.C.

Luminal inhibits cell division and the uptake of nitrogen by these cells. As in the case of so many other cells, inhibition of cell division approaches completion at an inhibitor concentration which has relatively much less effect on the rate of oxygen consumption by the cells.

The quantitative relation between inhibitor concentration and its effect on oxygen consumption suggests that the inhibitor affects two distinct metabolic systems, inhibition of one of these paralleling inhibition of cell division.

2.00 P.M.—Meeting of Sub-section MEDICAL SCIENCES (Room 203, Botany Building). Papers 16–26.

16. On the Mechanism of Alveolar Mucoid Fluid Production. By Charles C. Macklin, F.R.S.C.

The view is current that granular pneumonocytes are exocrine cells and their secretion is homologous to that of mucous cells of other parts of the endodermal system. The mucin-corresponding element is probably seen as extremely fine grains in tight clusters in the special granules and looking black with oil immersion dark medium phase. These seem hygroscopic, taking up water from alveolar air. Thus the water of mucoid fluid on the alveolar walls may come not from alveolar capillary blood (either *via* granular pneumonocytes or endothelium) but from respiratory tract and atmosphere.

17. The Changes in Length of the Spinal Cord with Changes in Posture and the Effect of These Changes on the Nerve Fibres in the Funiculi. By C. G. Smith. Presented by Charles C. Macklin, F.R.S.C.

During flexion and extension of the trunk each segment of the cord stretches in proportion to the amount of movement at the joint ventral to it. These changes in length are greatest in the lower cervical region where each segment varies in length as much as 25 per cent. Straight-leg-raising stretches the whole cord uniformly.

The nerve fibres of the cord behave like inelastic threads. When the cord becomes shorter the fibres adopt a wavy course. As the cord increases in length they are pulled into straight lines.

18. A Review of Enzyme Inhibitions by Phenothiazine and its Derivatives. By H. Bruce Collier, F.R.S.C.

Phenothiazine is best known as an anthelmintic; but it also possesses insecticidal, fungicidal, and antibacterial action. It causes haemolytic anaemia in some species, and may

suppress iodine uptake by the thyroid gland. Recently synthesized derivatives are powerful antihistaminic drugs. In an attempt to explain these properties of the compound, we have investigated enzyme inhibitions by phenothiazine and its water-soluble derivatives, and have found that the following enzyme systems are inhibited: catalase, succinic dehydrogenase, cytochrome oxidase, cholinesterase, hexokinase, glyoxalase, and lipoxidase. Possible relationships between molecular structure and pharmacological properties will be discussed.

19. Role of the Foetal Testis in Maturation of the Reproductive System. By Murray L. Barr. Presented by Charles C. Macklin, F.R.S.C.

Jost (1950) found that gonadectomized rabbit foetuses develop along female lines regardless of sex. He suggested that some cases of human "ovarian" agenesis may be male. The skin biopsy test of chromosomal sex provides a means of testing this hypothesis.

Skin biopsies were studied for 37 apparently female patients with "ovarian" agenesis. The epidermal nuclei have a male structure in 31 patients. These are thought to be cases of testicular agenesis where patients developed in the female direction in the absence of the secretion of the foetal testis. The other 6 patients have female-type nuclei and are ovarian agenesis subjects.

20. A Study of the Physical Advantages of Telecobalt Radiotherapy in the Treatment of Carcinoma of the Oesophagus. By J. Stewart Lott. Presented by Charles C. Macklin, F.R.S.C.

Cobalt^{60} beam therapy is a relatively recent and important addition to the armamentarium of the radiotherapist. The physical advantage gained by the use of this very short wavelength radiation is apparent in its more moderate effects on skin, bone, and lung, as well as in the lowering of integral dose. Superiority over conventional X-ray therapy is demonstrated in the treatment of cancer of the gullet. Some case illustrations from patients so treated under the direction of Dr. Ivan Smith at the Ontario Cancer Foundation London Clinic will be presented as a clinical impression rather than a statistical study.

21. The Genetic Basis for Breast Cancer in Man. By Madge T. Macklin. Presented by Charles C. Macklin, F.R.S.C.

A total of 840 families have been studied to determine whether close relatives of women with breast cancer have significantly more breast cancer than have women of similar age range and decade of death from the general population. Mothers, aunts, grandmothers, sisters, daughters of women with breast cancer have 2.5 to 3 times as much breast cancer as women from the general population. Their *total cancer rate* is approximately the same as that of the general population. Physiological factors play a role in suppressing or enhancing the genetic factors for breast cancer.

22. Stimulation of Anaerobic Glycolysis of Brain *in vitro* by Organic Substances. By D. H. Adams and J. H. Quastel, F.R.S.C.

It is well known that calcium ions stimulate anaerobic glycolysis in brain *in vitro*. In the present work it is shown that, in a sodium-potassium, but calcium-free medium, stimulation of anaerobic glycolysis may be effected by the presence of a number of organic bases, for example pyrrol, pyridine, and quinoline. The optimal stimulation may exceed that due to calcium. Mixtures of any of these organic substances with calcium do not give additive stimulatory effects. This suggests a common site of action. There is evidence that the optimal stimulation of the organic bases is related to the pKa of the base.

23. Distribution du I^{131} dans les tissus des cobayes vaccinés au BCG et au TAB. Par J. Sternberg et A. Frappier, M.S.R.C.

Sixty male guinea-pigs were vaccinated by scarification with BCG; another similar group was vaccinated with TAB by subcutaneous and intramuscular route, and a third control was scarified with an inert irritant. Every 15 days for a period of 3 months after vaccination, 6 animals of each group were injected with NaI^{131}; the animals were killed 48 hours later and the tissular distribution of the isotope was studied.

In BCG vaccinated animals, there is a significant increase of I^{131} concentration in adrenals liver, and intestines, as compared to that of the TAB group. This increase is more accentu-, ated even 15 days after vaccination, when the haemagglutination titer is completely negative, whereas the TAB agglutination titer is near its maximum value.

24. Propriétés biologiques et chimiques de deux fractions de H. pertussis. Par A. Frappier, M.S.R.C., J. de Repentigny, et A. Guérault.

Following the line of previous work on the antigenicity of surface washing of H. pertussis, comparison was made between those washings themselves and a special lytic extract of the bacilli obtained mechanically. Both proved to be antigenic and actively protected mouse against the experimental infection, but only the lytic extract was toxic.

Quantitative and comparative appreciation of the activity and protein composition of both fractions revealed that when injected in an even dose (dry weight basis), in mice, they are about equally antigenic.

The lytic extract contains much protein; the washings seem to be free from nitrogen.

These results show a possible advantage in using the washings as a vaccine.

25. Paper Electrophoresis in the Study of Plasma and Body Fluid Proteins in Disease. By Alan Bruce-Robertson, Joan Peppiatt, and James A. Dauphinee, F.R.S.C.

The disturbances in body metabolism which occur in many disease processes are often associated with specific alterations in the character or amount of one or more of the various fractions of the plasma proteins. The recognition of the occurence of these alterations may be of considerable importance from a diagnostic point of view and may help the physician the more readily to understand the nature of the pathological process. The presence of such alterations can readily be determined by paper electrophoresis, a procedure which frequently permits the recognition of abnormalities which are not detectable by other means. The usefulness of this analytical technique in this respect will be illustrated by a number of clinical examples.

2.00 P.M.—Meeting of Sub-section BOTANY and ZOOLOGY (Room 7, Botany Building). Papers 26–36.

26. Différences cytochimiques des mycobactéries en culture et dans les tissus vivants. I, Etude cytochimique des lipides de *Mycobacterium marianum*. Par M. Panisset et V. Portelance. Présenté par A. Frappier, M.S.R.C.

It has been shown by H. L. Sheenhan and F. Whitwell that *Mycobacterium tuberculosis* is stained by Black Sudan B. when examined from lesions or sputum. The same bacilli in culture are unstained by the same method.

While *M. leproe* and *M. phlei* are unstained by Sudan Black B, *M. marianum*, an organism isolated from lepromas which can be grown easily on culture media, stains black by this method and is very strongly and evenly acid-fast.

It seems that such an organism can be used for studying the differences between mycobacterial cells obtained from lesions or cultures.

M. marianum loses its stainability by Sudan Black B when treated by neutral organic solvents except acetone. The relations between this observation and the chemical composition of *M. marianum* are discussed by the authors following preliminary results of the analysis of the lipids of five lots of cultures.

27. The Life Cycle of *Stephanostomum baccatum* (Nicoll, 1907) (Acanthocolpidae: Trematoda). By Robert W. Wolfgang. Presented by Thomas W. M. Cameron, F.R.S.C.

The adult of *Stephanostomum baccatum* occurs in the rectum of the sea raven, the metacercaria encysts in the skin and muscles of flounders, and the rediae, which produce the cercariae, in the digestive gland and gonad of *Buccinum undatum* (L.) and *Neptunea decemcostatum*. *S. baccatum* occurs in the North Atlantic along the continental shelf from New England to Greenland and from Great Britain to Norway. Ecologically similar hosts carry the parasite in European waters. Infections are heavier in inshore than in offshore waters, and in Canada, the highest incidence is in the lower Bay of Fundy. Incidence is controlled by the presence and contact of the intermediate hosts.

28. Reaction to Temperature by Infective Larvae of *Nematodirus filicollis* (Nematoda). By John B. Poole. Presented by Thomas W. M. Cameron, F.R.S.C.

The third-stage infective larvae of *N. filicollis* survive for from fifty to sixty days in water at the optimum temperature of 30°C, repeated freezing and thawing (−6.5°C to 30°C) and 8 per cent lived after eight hours at −35°C. Larvae "conditioned" at −6.5°C survive an eight-hour exposure to −51°C, and after four hours at −65°C, 50 per cent survived at −6.5°C for twenty-two weeks; 10 per cent survived after being held at 52°C for eight hours. The percentage survival under desiccation is greatest at 22°C and nil at 76°C. These experiments show that *N. filicollis* larvae can tolerate a temperature range of from −65°C to 74°C.

29. Some Helminths of *Sagitta*. By Betty June Myers. Presented by Thomas W. M. Cameron, F.R.S.C.

Sagitta species, collected by Dr. A. H. Leim of the Atlantic Biological Station, from Passamaquoddy Bay, New Brunswick, contained the larval stages of a *Contracaecum* species and a larval scolex of a Tetraphyllidean tapeworm. A third worm, a digenetic trematode (*Derogenes* sp. inq.) collected from the intestine of *Sagitta*, contained eggs in the uterus suggesting that it is neotonic in this host.

The predatory nature and voracious feeding habits of *Sagitta* make this plankton form an efficient vector for intermediate stages of helminths maturing in marine vertebrates.

30. The Response of the White Pine Weevil to Ground-up Tissue from Susceptible and Non-Susceptible Trees. By J. M. Anderson and K. C. Fisher, F.R.S.C.

The adult white pine weevil, *Pissodes strobi* Peck, was exposed to the odour of ground-up

bark from various tree species in an olfactometer which provided a quantitative measure of the insect's response. The odour emitted by three native spruce species and white pine was "repellent," whereas the odour emitted by three exotic spruce species had no appreciable effect. With the exception of the results for white pine, there is a striking parallelism between the degree of species immunity to weevil attack in nature and the degree of "repellency" of the odour emitted by these species in our laboratory experiments.

31. Seasonal Variations in the Resistance of Goldfish to Temperature Stress. By William S. Hoar. Presented by W. A. Clemens, F.R.S.C.

Low temperature resistance of goldfish acclimatized to 20°C is relatively greater in the winter than in the summer. Likewise the resistance to heat is greater in the summer than in the winter. Variations in cold tolerance have been investigated more intensively and a distinction made between cold death and cold narcosis. Cold tolerance can be increased by dietary supplements of certain lipids but the effect is relatively greater in summer fish. Immersion in solutions of thyroxine and thiourea markedly increase cold tolerance in summer fish but have no protective action in winter fish. Male goldfish are more resistant to cold stress than female fish but the picture varies at different seasons. These findings are discussed in relation to seasonal changes in endocrine activity.

32. The Growth of *Brassica* Roots in Aqueous Solutions of Pectic Enzymes. By R. G. H. Cormack. Presented by H. B. Sifton, F.R.S.C.

In this study an attempt is made to bring about changes in the walls of root cap and epidermal cells of *Brassica* seedling roots by growing them in aqueous solutions of pectic enzymes. Many treated roots show marked sloughing of root cap tissue and separation of neighbouring epidermal cells. These results indicate a change in the cementing layer of the primary walls of root cap and epidermal cells. The results also strengthen the view that the cementing layer is entirely pectic in nature.

33. Recent Observations on the Metabolism of D-Xylose. By Rolf M. Hochster. Presented by W. H. Cook, F.R.S.C.

The initial stages in the metabolism of xylose by cell-free extracts of *Pseudomonas hydrophila* have been worked out and methods have been devised to permit isolation and characterization of the active intermediates (as the free sugars). Evidence will also be presented to show that xylose isomerase, the first and perhaps the rate-limiting enzyme in this sequence, is an -SH enzyme. It is now possible to picture the probable metabolic pathway involved and to integrate this with present knowledge of the mechanisms of carbohydrate metabolism in general.

34. Purification and Electron Microscopy of Some Stone Fruit Viruses. By M. Weintraub and R. S. Willison. Presented by W. F. Hanna, F.R.S.C.

Partially purified, infective preparations of stone fruit viruses were obtained by centrifugal and chemical methods. The clearest preparations were made from peach and cherry petals, followed by those from cucumber leaves, and peach leaves. Cherry leaves did not yield infective preparations.

The purified extracts were used for detection with the electron microscope of particles peculiar to diseased plants. Recognition of virus particles was made difficult by the presence of particles of the same size range both in infective extracts and in extracts from healthy

tissues. However, statistical comparison yielded the probable sizes of the infectious particles, these ranging from 25 to 30 millimicrons for rose mosaic virus, to 40 to 45 millimicrons for cherry yellows and necrotic ring spot viruses.

35. Evolution of Meristic Relations in the Dorsal and Anal Fins of Teleost Fishes. By C. C. Lindsey. Presented by W. A. Clemens, F.R.S.C.

Unlike most rows of serially repeated organs lying along the major axis of animals, the median fin rays of fishes do not usually show one-to-one correspondence with the body segmentation. Earliest known Teleosts had a large excess of external rays over internal basal supports, and more basal supports than adjacent vertebrae. The number of fin rays has been gradually reduced during the course of evolution and agrees one-to-one with the basal supports in all but the most primitive surviving Teleosts. Such a plan confers strength and manœuvrability. Basals still outnumber adjacent vertebrae in most Teleosts, although serial correspondence between the two series has developed independently in several groups. Little support is available for the theory of the origin of dorsal and anal fins of Teleosts from a continuous median fin fold, nor for the belief that basals represent detachments from the vertebrae.

36. Assessment of Early Differentiation of *Pinus* Proembryos transplanted to *in vitro* Conditions. By Norman W. Radforth and L. Pegoraro. Presented by G. Krotkov, F.R.S.C.

Proembryonic units of *Pinus* sp. removed from *in vivo* environment and transferred to nutrient medium were subsequently examined in the hope of revealing some of the fundamental factors governing establishment of early embryonic growth patterns and differentiation. It is shown that life can continue *in vitro*, that in some cases growth is achieved, and that three dimensional rather than filamentous organization is the tendency. Age of the postzygotic mass in relation to adoption of three dimensional growth is discussed.

Wednesday, June 8

9.00 A.M.—Meeting of Section (Room 7, Botany Building). Papers 37–46.

37. The Behaviour of the Varying Lemming in a Temperature Gradient. By Donald A. Smith and K. C. Fisher, F.R.S.C.

Lemmings are the only animals tested thus far which failed to select a portion of a temperature gradient. However, temperature receptors were being stimulated because these normal lemmings were much more active in the gradient than at room temperature. Lemmings whose soles had been clipped naked selected the zone 27–35°C. in the gradient. The existence of dual thermoreception mechanisms is suggested. Stimulation of thermoreceptors in the feet leads to temperature selection, while stimulation of the second leads to increased locomotor activity. The dense fur on the soles of normal lemmings interferes with the first mechanism and thus with temperature selection.

38. The Role in the Peach Replant Problem of Toxic Substances produced in the Soil. By Z. A. Patrick. Presented by W. F. Hanna, F.R.S.C.

Peach seedlings planted in soils shortly after the removal of peaches therefrom are characteristically stunted and unhealthy. Results are presented which indicate that this response may be due in part to the release into such soils of decomposition products of the amygdalin which is a normal constituent of peach roots. This decomposition is the result of microbial action and micro-organisms capable of bringing it about are stimulated in soils by growing peaches in them.

39. Some Effects of Muscular Activity on the Blood of the Kamloops Trout, *Salmo gairdnerii kamloops*. By Edgar C. Black. Presented by A. H. Hutchinson, F.R.S.C.

The blood levels of fish having reference to haemoglobin, glucose, and lactic acid were followed under a variety of conditions, including: those immediately 2, 3, 5 and 15 minutes of vigorous activity; after 15 minutes of exercise followed by recovery during periods up to 24 hours; after vigorous activity for 3 minutes in water at three different oxygen tensions; and after moderate steady-state exercise for periods of 15 and 30 minutes. The findings are discussed in relation to the general biological status of the Kamloops trout.

40. Seasonal Changes in Composition of Some Pacific Coast Brown Seaweeds. By D. J. Wort. Presented by A. H. Hutchinson, F.R.S.C.

Macrocystis integrifolia and *Nereocystis luetkeana* were collected at monthly intervals for two years. Analyses revealed a parallel variation in composition of the two species and that the fronds had a higher content of all substances measured than did the stipes. The periods of maximum concentration were: Dry weight and ash—late fall; Nitrogen, ether-solubles, mannitol, fucoidin, laminarin—March; Phosphorus—winter. No well-marked or recurrent minima or maxima were observed for algin, sulfur, copper, zinc, and iron. An attempt was made to relate changes in composition with environmental conditions.

41. Modification of Growth Regulatory Properties of 2-4-Dichlorophenoxyacetic Acid by Additives. By D. J. Wort. Presented by A. H. Hutchinson, F.R.S.C.

The usual growth regulatory effects of 2,4-D are modified by the addition of salts of Cu, Fe, Ni, and Co to the 2,4-D solution applied to the aerial parts of a number of higher plants. The original phytotoxic action is restored by the further addition of various forms of nitrogen. The prolific production of roots by plants treated with metallo-2,4-D solutions, together with the disappearance of lethal properties of the spray, suggests a distinction between hormonal and herbicidal activity of the growth regulator.

42. Structural Variation Range in Organic Terrain. By Norman W. Radforth. Presented by G. Krotkov, F.R.S.C.

Studies in organization of northern muskeg reveal necessity for reference to sixteen classes of macroscopic plant remain combinations. A method of differentiating these categories on a structural basis is presented. Size and relationships of constituents are discussed, and biological implications are utilized to suggest the degree of artificiality in the reference system. The feasibility of estimating relationship of structural change to depth of organic terrain is discussed. The importance of the method for indicating drainage and bearing potential is assessed.

43. The Inheritance of Body Weight and Litter Size in a Cross of Two Inbred Strains of Mice. By L. Butler. Presented by J. R. Dymond, F.R.S.C.

Reciprocal crosses made between C57 Bl and Balb, reveal that litter size increases in the F_1, reaches a maximum in the F_2, and then declines in the backcrosses. Whenever one of the parent strains is used as the female parent in a cross, there is a maternal effect which depresses litter size. The genotype of the young influences the litter size in the case of Balb females, but has no effect when the female is from the C57 Bl strain. When a Balb female is fertilized by sperm from another strain, small litters of two and three young, such as are produced by Balb X Balb are no longer produced, and at the same time litters of 10–12 young are born. Litters of this size never occur when the young are of the Balb genotype. The sixty-day weights of the hybrid young are 15 per cent heavier than the weights of inbred mice borne by the same females. The weight variance for the different generations is not what is usually expected in such crosses. It is highest in the F_1 and P_1, lower in the backcrosses, and lowest in the F_2.

44. Patterns of Fetal Growth in European and Asiatic Mongoloid Imbeciles. By Norma Ford Walker. Presented by J. R. Dymond, F.R.S.C.

The term "mongoloid imbecility" has been considered an unfortunate one. The Asiatic peoples have resented it and the suggestion has been made that the name should be changed to one describing the retention of fetal characters. We had anticipated that the dermal patterns of European mongoloid imbeciles would vary to a greater degree from those of the normal Chinese and Japanese than they do from normal Europeans. This supposition was in part false. The present studies of dermal patterns show that the term "mongoloid" is not inappropriate from the European standpoint.

45. Further Observations on the Transmission and Development of *Leucocytozoon simondi* Mathis and Leger in Ducks. By A. M. Fallis, G. F. Bennett, A. H. Houston. Presented by Dr. H. B. Speakman, F.R.S.C.

The results of work on *Leucocytozoon simondi* in ducks in Algonquin Park, Ontario, indicate that rapid transmission and high mortality occurred among ducklings exposed to natural infections in June and July during the past five years. It was shown that the black flies, *Simulium venustum*, *S. parnassum*, and *S. ruggelsi*, were suitable intermediate hosts. The last species appeared to be an important vector during the last three weeks of July.

Some gametocytes reached their maximum size 48 hours after they entered the blood stream, although others grew more slowly. As these mature gametocytes were observed, at times, five to six days after the ducks were infected, an asexual cycle must have been completed in three to four days. This was suggested also by the observations of asexual stages in the tissues. Transfer of cardiac blood from infected to healthy ducks showed that asexual stages, although not observed in blood, were present in the former ducks at certain times prior to, and following the appearance of gametocytes in the peripheral circulation.

46. A Hypothesis regarding the Relation of Temperature to Biochemical and Physiological Differences in Certain Freshwater Fishes and Their Distribution and Activity. By Edgar C. Black. Presented by A. H. Hutchinson, F.R.S.C.

Fishes like the trout which are adapted to survival and activity in colder waters have certain biochemical and physiological features such as a low upper lethal temperature, low

oxygen affinity of haemoglobin, large Bohr effect, high limiting oxygen tension, and a high level of lactic acid in the blood following vigorous activity. Reversals of the quantitative characteristics mentioned above are noted at low temperatures in fishes such as the catfish which are able to endure low temperature with difficulty and are better fitted for activity and survival in warmer water. A brief exposition including the probable significance of these quantitative differences in the establishment of seven species is presented.

Wednesday, June 8

2.00 P.M.—Meeting of Section (Room 7, Botany Building). Papers 47–49.

47. Fertilization of Algonquin Park Lakes. By R. R. Langford. Presented by J. R. Dymond, F.R.S.C.

Three lakes from 50 to 100 acres in area were each fertilized annually with approximately four tons of 12-24-12 fertilizer for from two to six years. One lake was used as a control. The results of fertilization were: (1) marked oxygen depletion of bottom waters during both summer and winter stagnation; (2) increases in phytoplankton and zooplankton populations; (3) early increases in bottom fauna followed by a decrease in later years, probably as a result of hypolimnial oxygen depletion; (4) certain fish showed increased rates of growth for certain fish and greater abundance of some species—the deterioration of oxygen conditions may have been responsible for lack of increase of others. Fertilization of these small but relatively deep oligotrophic lakes to increase production of either lake trout or speckled trout appears questionable in view of the environmental effects resulting from increased eutrophication.

48. The Thermal Gradient underlying Distribution of Aquatic Insects in a Stream, with Latitude and with Season. By F. P. Ide. Presented by J. R. Dymond, F.R.S.C.

Insects were sampled at one stage of the life cycle, at different points and times, along streams in localities from south to north in Canada. The climatic factor of temperature was investigated and the three gradients—seasonal, stream, and latitudinal—determined. In these non-migratory animals the first, only, is experienced by individuals and the other two and the associated distribution are resultant. The underlying factor in both time and space distribution is the thermal gradient, a limited range of which is suitable for the activity of each kind of organism, and outside of which they are inactive, generally in diapause.

49. On the Egg-laying Habits of Some Diprionidae (Hymenoptera). By C. E. Atwood. Presented by J. R. Dymond, F.R.S.C.

In the genus *Neodiprion*, family Diprionidae, determination of species by examination of adults is difficult or impossible on the basis of present knowledge. Preliminary work with immature forms has shown that in some cases differences in cocoons, in larvae, or in egg-patterns may help in establishment of species limits.

This paper deals with the oviposition habits of *Neodiprion banksianae* Roh. and related species, first as matters of interest in themselves and secondly as an aid to the understanding of certain populations from the taxonomic point of view.

50. Les Oxydases Terminaux dans les Racines de Semis de Conifères. Par André Lafond. Présenté par Georges Maheux, M.S.R.C.

Les expériences poursuivies par l'auteur, à l'aide du microrespiromètre de Warburg, indiquent que l'acide ascorbique oxidase serait l'enzyme terminal de la respiration que l'on trouve le plus fréquemment, dans les racines des semis, chez les principales espèces de Pinus, Picea, Abies et Larix du Québec et aussi chez certains champignons qui les mycorrhisent. L'effet de diverses substances sur l'absorption de l'oxygène par les racines est décrit, de même que les méthodes employées.

51. Relation between Temperature Fluctuations and Birch Dying in Eastern Canada. By René Pomerleau, F.R.S.C.

After having discarded living organisms as primary agents of the extensive damage which has occurred in birch stands of eastern Canada since 1938, the author has attributed this disease to unfavourable physical factors. Recent analyses of climatic data revealed that annual and summer temperature means have considerably increased in most stations since 1875, especially since 1925. An important rise which was noticed three consecutive years—1937 to 1939—coincided with the onset of the decadene. Other subsequent periods of high summer temperature were fatal to birch and sometimes to other tree species. Direct correlations between the ring-growth pattern of a large number of trees and weighted temperature curves of June, July, and August clearly indicate sensitivity in both white and yellow birch to unusually high soil temperature.

OCEANOGRAPHIC SESSION

(Arranged by Canadian Committee on Oceanography)

Wednesday, June 8

8.00 P.M.—Room 101, Biology Building.

Pacific Coast

1. The Effect of Some Oceanographic Factors on the Distribution of Certain Benthonic Organisms. By Robert F. Scagel. Presented by W. A. Clemens, F.R.S.C.

Following the analysis of physical-chemical data, and as a result of biological observations extending over several years, it is suggested that the distribution of certain benthonic plants and animals along the coast of British Columbia may reflect the salinity distribution in both time and space. Queen Charlotte Strait has been selected for a more detailed analysis of the problem. Among the organisms observed are, in the algae, *Postelsia palmaeformis, Macrocystis integrifolia, Nereocystis luetkeana, Laminaria andersonii, Hedophyllum sessile, Alaria nana, A. marginata* and *A. valida*, and in the invertebrates, *Mitella polymeris, Strongylocentrotus purpuratus, Mytilus californianus* and *Haliotus kamtschatkana*.

2. Some Factors Influencing the Distribution of Pelagic Copepods in the Queen Charlotte Islands Area. By Frances E. Cameron. Presented by W. A. Clemens, F.R.S.C.

The distribution of certain copepod species of the north coast of British Columbia suggests that breeding is restricted to limited regions of well-defined temperature and salinity characteristics. Currents are responsible for the spread of juveniles and adults from these areas. A description of the probable circulation pattern in the vicinity of the Queen Charlotte Island as inferred from plankton collections is submitted.

Northeastern Canada

3. The Present Status of Climatic Change in the Atlantic Sector of Northern Seas. By M. J. Dunbar, F.R.S.C.

Temperatures in west Greenland waters show no warming since the middle 1930's, and there is independent evidence that the last peak of climatic "amelioration" occurred about that time. There is also biological evidence that the marine climate in the 1880's, in the Canadian eastern arctic, was warmer than in most recent decades, not excluding the amelioration since the 1920's. It is suggested that the relation between the Canadian eastern arctic and west Greenland in this respect is a function of variations in transport of the Irminger Current and the Canadian (Baffin Island) Current, which are themselves interconnected.

4. Density Inversions in the Sea in Regions of High Tidal Activity. By M. J. Dunbar, F.R.S.C.

Records of density inversions in the sea, with consequent conditions of instability, have been looked upon in the past as fictitious, the result of errors in instrumentation, field method, or titration. There are recent indications from various quarters that inversions may not in fact be uncommon. The present paper describes inversions observed at 20 stations out of a total of 48 in Ungava Bay, Hudson Strait, and Frobisher Bay, 1949–51. Statistical analysis shows them to be on the margin of significance, when related to the state of the tide at the time of observation.

5. Annual Variation of the Surface Winds in the Davis Strait–Greenland–Labrador Region. By J. G. Potter. Presented by Andrew Thomson, F.R.S.C.

During World War II a number of meteorological observing stations were established in this region and an ocean weather ship position at 56° 30′ N, 51° 00′ W has been manned since November, 1947. From the accumulated data it is now possible to show general pattern of prevailing surface winds, frequency of occurrence of surface winds of different directions, and their mean speed.

6. Climatic Trends along the Atlantic Coast of Canada. By M. K. Thomas. Presented by Andrew Thomson, F.R.S.C.

Meteorological observations have been recorded since the 1870's at coastal Nova Scotia and Newfoundland stations. Observations began at Sable Island in the 1890's, along the Labrador coast in the 1930's, and at Resolution Island in 1929. Mean annual temperatures have been increasing since the 1920's but there is evidence that the trend may now be levelling off or has even been decreasing during the past three years. Seasonal temperature trends are discussed as are trends in other meteorological elements.

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